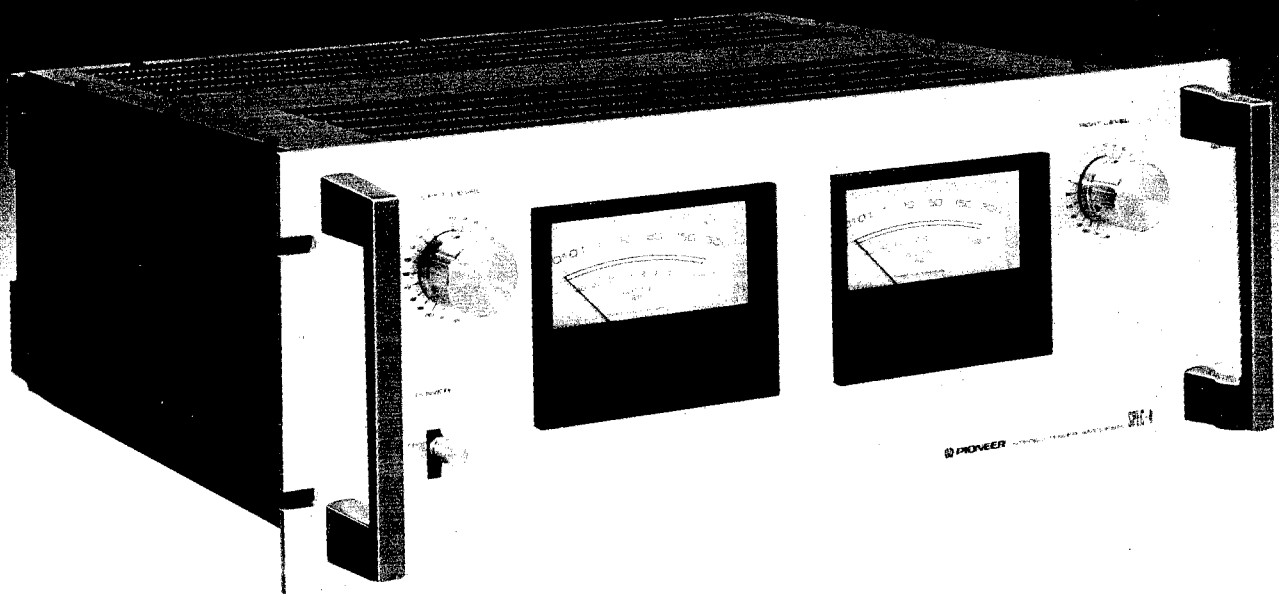


STEREO POWER AMPLIFIER

# SPEC-4

## SERVICE MANUAL



 **PIONEER®**

MODEL SPEC-4 COMES IN TWO VERSIONS DISTINGUISHED AS FOLLOWS:

| Type | Voltage                                | Remarks              |
|------|----------------------------------------|----------------------|
| KU   | 120V only                              | U. S. A. model       |
| S    | 110V, 120V, 220V and 240V (Switchable) | General export model |

- This service manual is applicable to KU(p2—p40) and S(p41—p48) types.
- For servicing of S type please refer to KU type with the exception of descriptions in the Additional Service Manual (p41—p48).

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## 1. SPECIFICATIONS

### Semiconductors

|                   |    |
|-------------------|----|
| ICs .....         | 2  |
| Transistors ..... | 61 |
| Diodes .....      | 62 |

### Power Amplifier

Circuitry ..... Current mirror loaded differential Amplifier,  
3-stage darlington parallel push-pull, direct-coupled OCL.

Continuous Power Output from 20 Hertz to 20,000 Hertz  
(Both channels driven) . . . 180 watts per channel (4 ohms)  
150 watts per channel (8 ohms)

Total Harmonic Distortion (20 Hertz to 20,000 Hertz, 8 ohms)

Continuous rated power output ..... 0.01%

75 watts per channel power output ..... 0.01%

1 watt per channel power output ..... 0.01%

Intermodulation Distortion (50 Hertz: 7,000 Hertz=4:1, 8 ohms)

Continuous rated power output ..... 0.01%

75 watts per channel power output ..... 0.005%

1 watt per channel power output ..... 0.005%

Frequency Response . . . . 5 Hertz to 100,000 Hertz  $\pm 1$  dB

Input (Sensitivity/Impedance) ..... 1V/50k ohms

Output

Speaker ..... 4 ohms to 16 ohms

Damping Factor (20 Hertz to 20,000 Hertz, 8 ohms) ..... 100

Hum and Noise (IHF, short-circuited, A network) ..... 115dB

### Miscellaneous

Power Requirements ..... AC 120V 60 Hertz

Power Consumption ..... 760 watts (UL)

Dimensions ..... 480(W) x 187(H) x 445(D) mm

18-7/8 x 7-3/8 x 17-7/16 in

Weight: Without Package ..... 24.5kg; 53lb 14oz

### Furnished Parts

Connection Cord with Pin Plugs ..... 1

Operating Instructions ..... 1

### NOTE:

*Specifications and the design subject to possible modification  
without notice due to improvements.*

## 2. FRONT PANEL FACILITIES

### POWER SWITCH

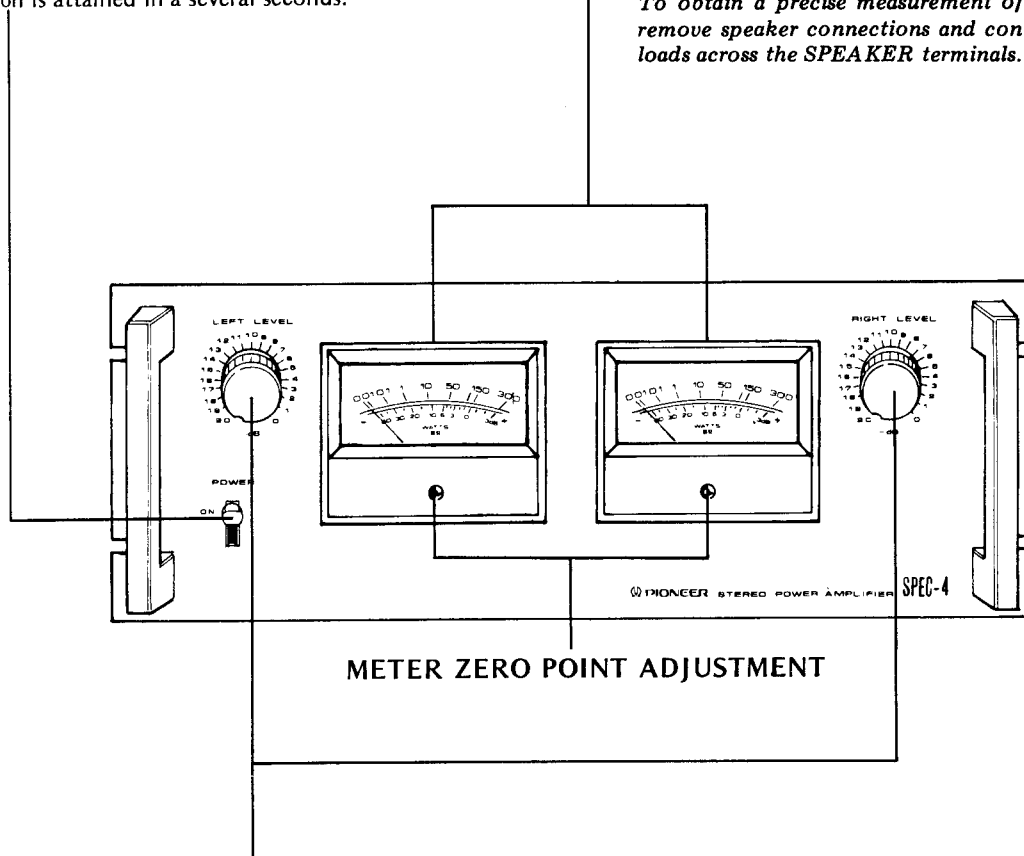
Set to ON position to energize SPEC-4. After setting to ON, there is a brief delay before sound is obtained. This is due to the operation of the muting circuit which prevents noise when the POWER is switched. This function does not indicate difficulty and normal operating condition is attained in a several seconds.

### PEAK LEVEL METERS

When speaker systems of 8ohm nominal impedance are connected, these provide direct readout of the peak output power in Watts.

#### NOTE:

*Speaker system impedance varies according to frequency. To obtain a precise measurement of the output power, remove speaker connections and connect 8ohm dummy loads across the SPEAKER terminals.*



### INPUT LEVEL CONTROLS (LEFT & RIGHT)

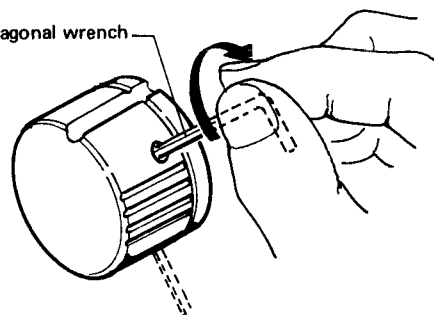
Adjust the LEFT and RIGHT controls according to the output level (voltage) of the preamplifier connected to the SPEC-4's INPUT (L, R) terminals. If the controls are turned fully to the right (to the "0dB" position), then the rated input will be 1V. Conversely, if they are turned to the left, this will yield an attenuation equal to the graduations, and the rated power output can be varied. Standard input voltages are: 0dB = 1V, -6dB = 2V, -10dB = 3V, -12dB = 4V, and -14dB = 5V.

#### NOTE:

*Turn the controls counterclockwise to the 0dB position if you are using a preamplifier with a maximum output voltage of less than 1V. In such cases, it will not be possible to yield the rated power output listed in the SPEC-4's specifications. (For example one-quarter of the power output is obtained with a preamplifier having a maximum output of 0.5V.)*

### HEXAGONAL WRENCH

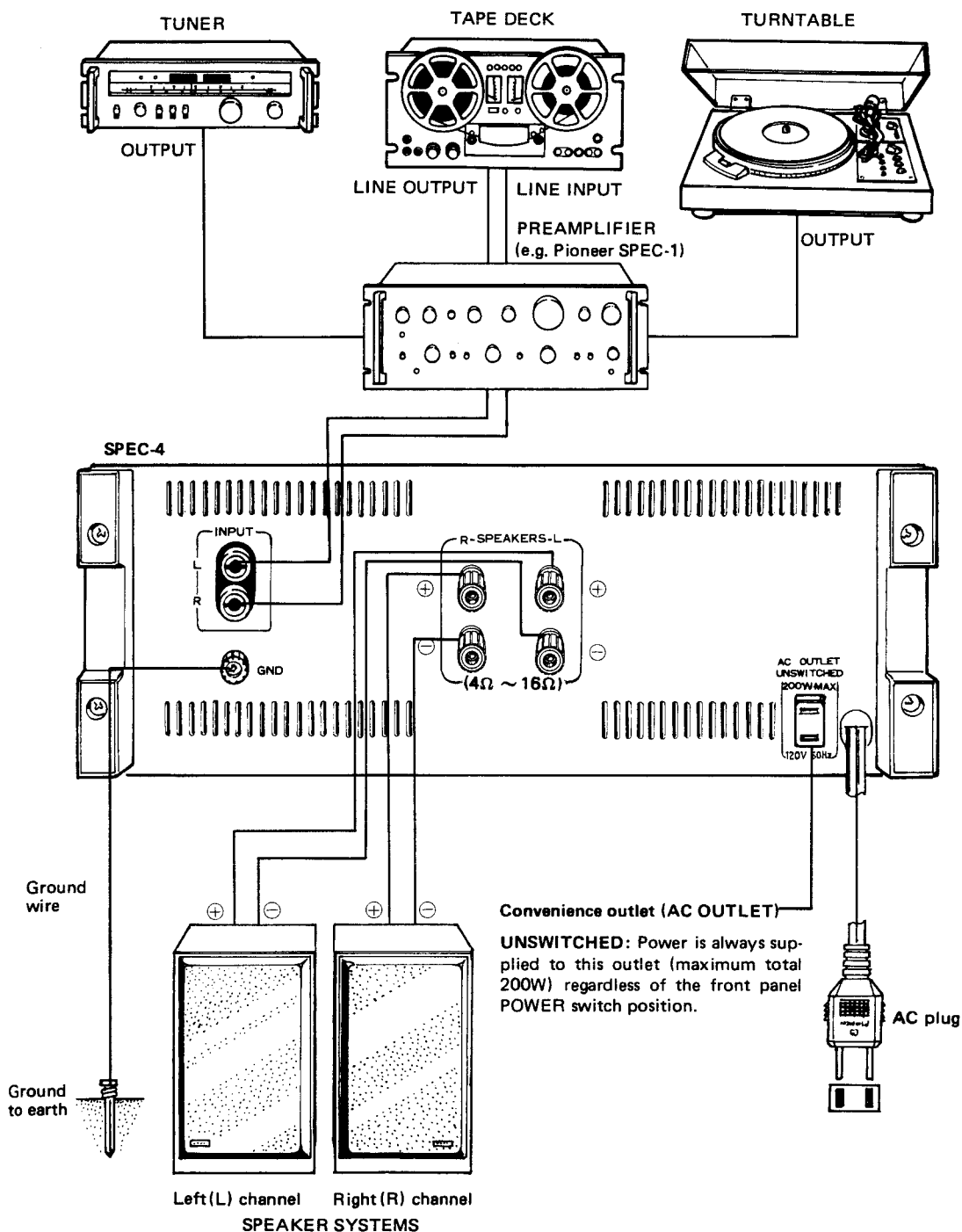
Hexagonal wrench



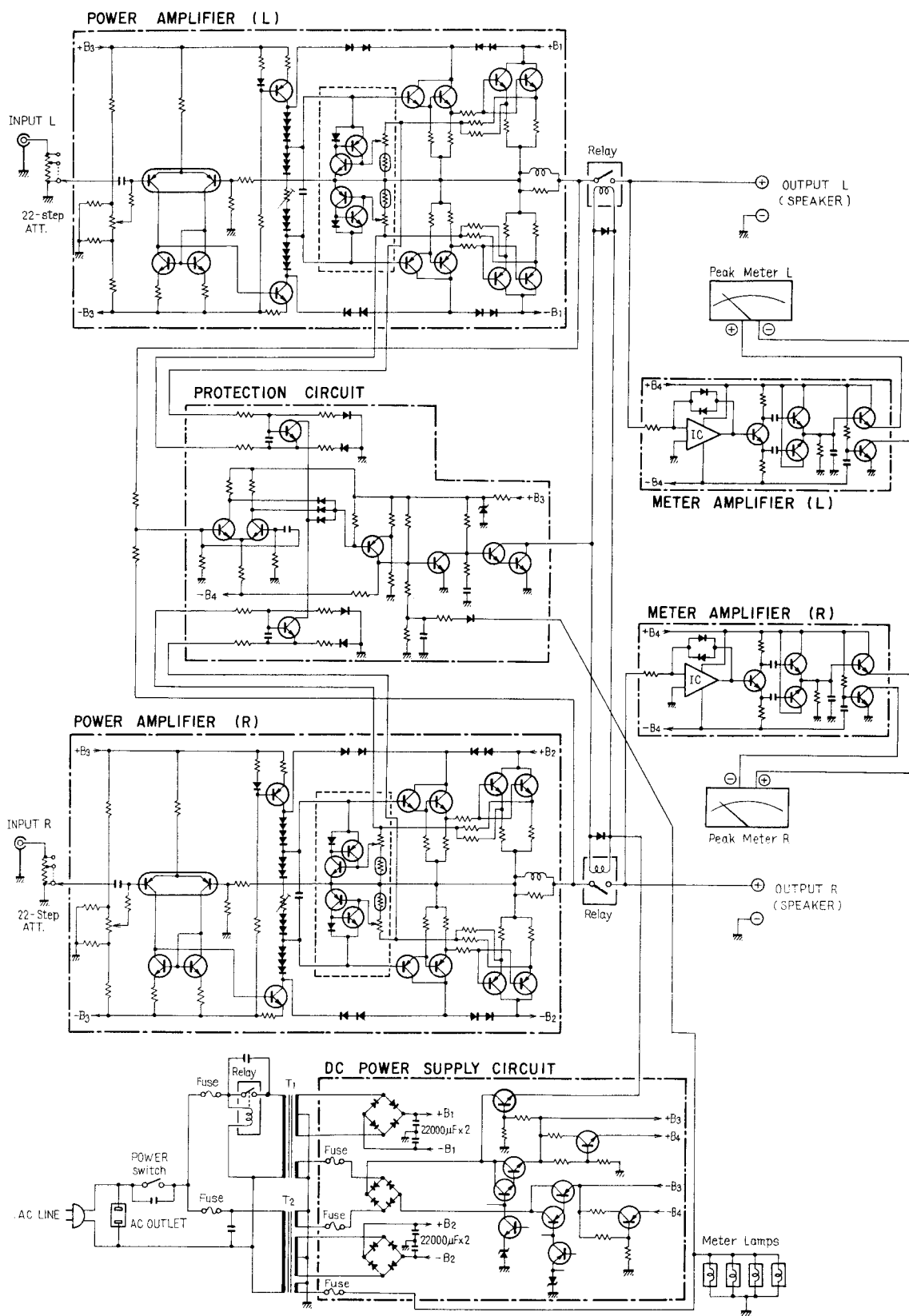
If any of the control knobs should happen to come loose, tighten by means of the hexagonal wrench.

### 3. CONNECTION DIAGRAM

Before making the connections, check that the power is off. Also, make sure that you turn the power off if you want to change over the connections when the components are operating.



# 4 BLOCK DIAGRAM





The input signal is divided by  $R_1$ ,  $R_2$  and sent to the logarithmic compression circuit. The logarithmic compression circuit is an audio IC (TA7136P2) and utilizes the rise characteristic of diodes  $D_1$ ,  $D_2$  in the NFB loop to reduce the dynamic range of the signal. This creates an input/output characteristic which attenuates low level inputs very little and high level inputs substantially. The characteristic is compensated by inserting  $R_4$  in parallel with  $D_1$ ,  $D_2$  and the circuit is temperature compensated with a thermistor so that the meter scale is almost logarithmically graduated from 0.01W to 300W.

The compressed signal is applied to the absolute value detector. This circuit produces a reverse phase signal by means of  $Q_2$  and extracts and combines the positive half cycle by means of  $Q_3$  and  $Q_4$ . This signal charges  $C_1$  up to the peak value and drives the meter by means of  $Q_5$ ,  $Q_6$ . The charge across  $C_1$  is discharged at the time constant of  $C_1$  and  $R_5$  to determine the fall time of the peak indication of the meter.

The frequency response of the peak meter is given in Fig. 3.

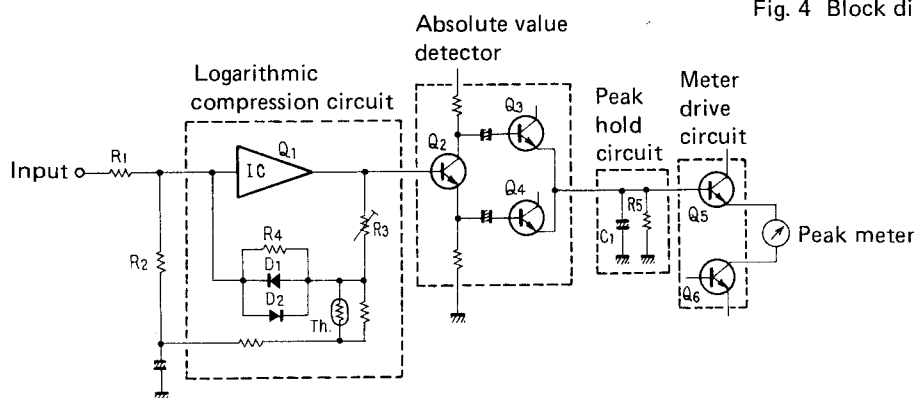


Fig. 2 Meter amplifier circuit

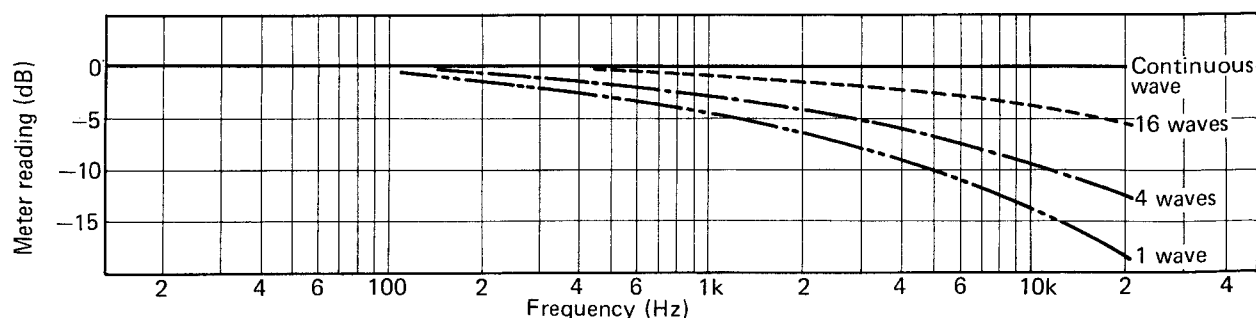


Fig. 3 Frequency response of the peak meter

### 5.3 PROTECTION CIRCUIT

This circuit protects the power transistors in case of overload, the speakers in case of power amplifier malfunction, and also performs a muting function when the power supply is turned ON or OFF. The protection circuit is composed of three sections (Fig. 4).

#### 1. Relay Driver Circuit (Fig. 5)

The relay which connects the output circuits is driven by this circuit. It also performs a muting function to prevent unpleasant noise during ON-OFF operation of the power supply as well as opening the output circuit on command from the detector circuits.

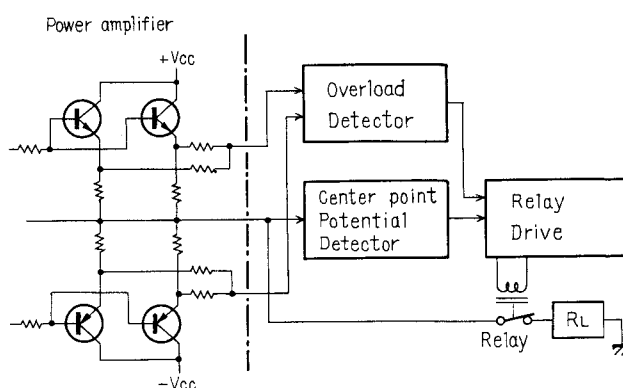


Fig. 4 Block diagram of protection circuit

## Muting Operation

When the power supply is turned ON,  $Q_{11}$  base is reverse biased through  $D_2$  and  $R_{22}$ , turning  $Q_{11}$  OFF.  $Q_{12}$  base potential rises as  $C_1$  charges through  $R_1$  &  $R_2$ , and  $Q_{12}$  &  $Q_{13}$  turn ON several seconds later. The collector current of  $Q_{13}$  then flows through the relay coil, operating the relay to turn on the power amplifier output circuit. The reverse bias of  $Q_{11}$  base from  $D_2$  &  $R_{22}$  disappears when the power supply is set from ON to OFF.  $Q_{11}$  remains ON however, due to the residual power supply voltage.  $C_1$  very rapidly discharges,  $Q_{12}$  base potential drops and  $Q_{12}$  &  $Q_{13}$  turn OFF. The relay releases and the power amplifier output circuit turns OFF.

**NOTE:**

$Q_{10}$  is normally OFF due to base bias and does not participate in the muting operation.

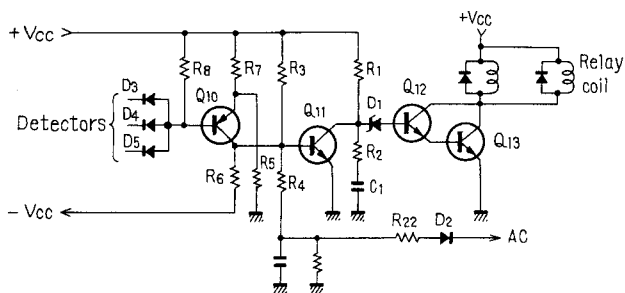


Fig. 5 Relay drive circuit

### Operation by Detector Circuit Command

Command from the detector circuits pass through one of  $D_3$ ,  $D_4$  or  $D_5$  and are applied in the form of a current flow.  $Q_{10}$  is normally reverse biased through  $R_8$ , but when a large current flows through on of these diodes,  $Q_{10}$  base potential declines according to the voltage drop at  $R_8$ .  $Q_{10}$  then turns ON,  $Q_{11}$  base potential rises and  $Q_{11}$  turns ON.  $C_1$  rapidly discharges and  $Q_{12}$  base potential drops, turning  $Q_{12}$  &  $Q_{13}$  OFF. The relay releases and the power amplifier output circuit becomes cut off.

## 2. Overload Detector Circuit

Shorting of the power amplifier load or a load impedance below the specified value causes a command to be sent to the relay drive circuit. This is illustrated in Fig. 6.

With the output stage in class B operation, when  $Q_a$  is operating in the positive half cycle,  $Q_b$  becomes cut off and the signal current flows as indicated by the solid arrows in Fig. 6. Point D potential at this time is the point A potential divided by  $R_{49}$  and  $R_{50}$ . Also, point C potential is

the point A potential divided by  $R_{e1}$  and RL (load). Point D is connected to  $Q_{12}$  base and point C to  $Q_{12}$  emitter through  $R_{48}$  and  $R_{e2}$ . When RL is extremely small, the point C potential becomes considerably lower than point D. This potential difference forward biases  $Q_{12}$ .  $Q_{12}$  turns ON and current flows in  $D_3$ .

Qb operates in the negative half cycle and Qa becomes cut off. The signal flows is indicated by the broken line arrows in the center of Fig. 6. Q<sub>12</sub> is biased by the potential difference between point C and point E. If RL is extremely small, the point C potential becomes considerably higher than that of point E. Q<sub>12</sub> turns ON and current flows in D<sub>3</sub>.

If large current flows in  $Q_a$  and  $Q_b$ ,  $Q_{12}$  becomes ON due to the  $Re_1$  and  $Re_2$  voltage drops, and current flows in  $D_3$ .  $C_{24}$  prevents faulty operation due to external noise.

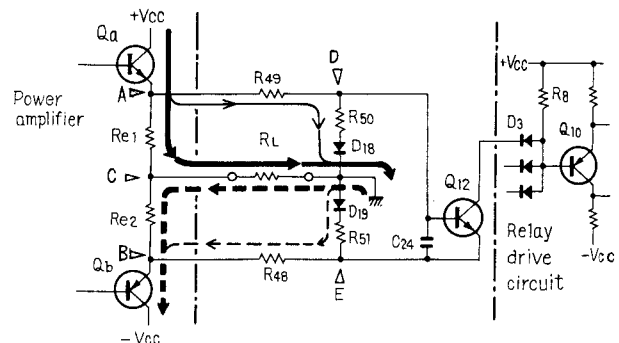


Fig. 6 Overload detector

### 3. Center Point Potential Detector Circuit

If a DC potential is produced at the junction point of the power amplifier, a command is sent to the relay drive circuit. Fig. 7 shows this operating principle.

$Q_8$  and  $Q_9$  compose a differential amplifier. When the same input is applied to both input terminals ( $Q_8$  and  $Q_9$  bases), no output is present. However, if there is a difference between the terminal inputs, the difference is amplified and becomes the output between the two collectors. During normal operation, an AC signal only is present at the junction point. As  $C_3$ ,  $C_4$  reactance is sufficiently low, the same signal is applied to  $Q_8$  and  $Q_9$  bases, resulting in an absence of output at the collector sides.

When a DC potential is produced at the junction point, it becomes the input of  $Q_9$  only. If the voltage is negative,  $Q_9$  collector current declines.

and at  $Q_8$  the collector current increases and the potential drops, causing current to flow through  $D_5$ .

If the DC voltage is positive,  $Q_9$  collector current increases and the potential drops, while at  $Q_8$  the collector current decreases and the potential rises. Current therefore flows through  $D_4$ .

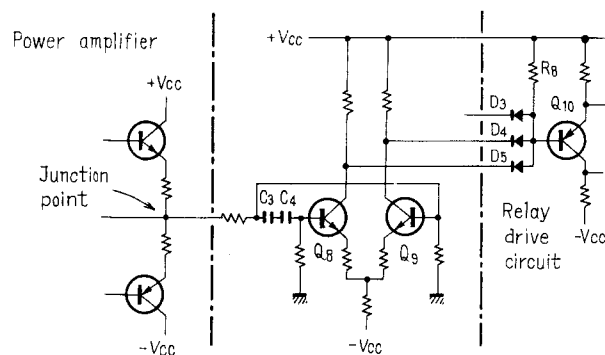


Fig. 7 Center point potential detector

### 5.3 POWER SUPPLY CIRCUIT

Two power transformers are used. The left channel and right channel power stage power supplies are independent. Power is supplied to each channel by a bridge rectifier and two 22,000 $\mu$ F high capacity capacitors. The power supply before the predriver and for the main amplifier, protection circuit, etc. is supplied to each part thru a bridge rectifier and minus and plus voltage regulators by connecting the windings (different from that of the power stage) of the two power transformers in series.

#### Surge Current Countermeasures

When the power of an amplifier having two high capacity power supplies such as this unit is turned ON, an extremely large rush current flows. The time the left and right power transformers are powered is staggered somewhat in this amplifier to reduce this rush current to a minimum.

When the power switch is turned ON,  $T_2$  (right channel power transformer) is immediately powered, but since the relay contacts are open,  $T_1$  (left channel power transformer) is not powered. When current flows in the coil of the relay, the relay contacts are closed and  $T_1$  is powered. The rush current is reduced by one half during this 7–9msec delay.

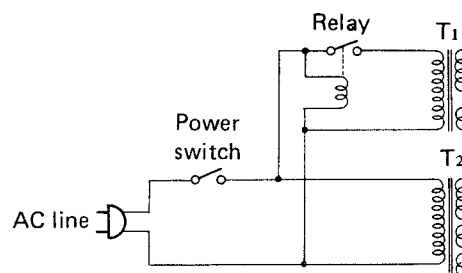


Fig. 8

### 5.5 OTHERS

The electrolytic capacitor ground connection is a 20mm x 2mm copper plate.

A cord (inner conductor 2.03 $\phi$ , 0.254 $\phi$  x 41 stands) having a DC resistance of about 1/4 that of common electric wire is used in the power supply, output, and ground circuits.

The input attenuator covers the 0 to -20dB range in 22 steps. The final position is  $-\infty$ .

## 6. DISASSEMBLY

### Top cover

Remove the 12 screws(A) to detach the top cover.

### Front panel

Loosen the set screws of the 2 LEVEL knobs with an hexagonal wrench and remove all the knobs.

Remove the 8 screws(B) and 2 nuts(D) to detach the front panel.

### Bottom plate

Remove the 17 screws(C) at the bottom plate and lift off the bottom plate.

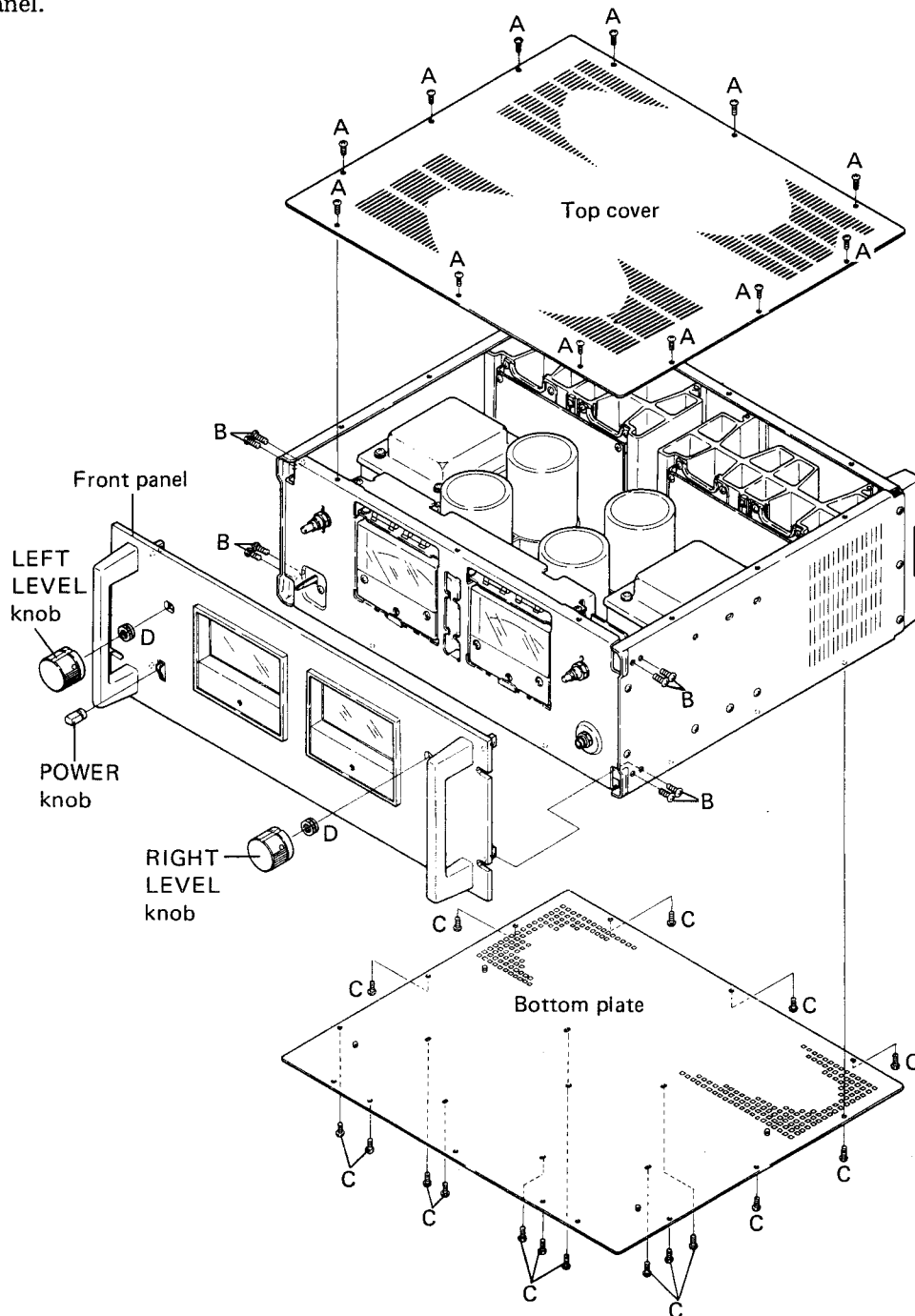


Fig 9

## 7. PARTS LOCATION

### Front Panel View

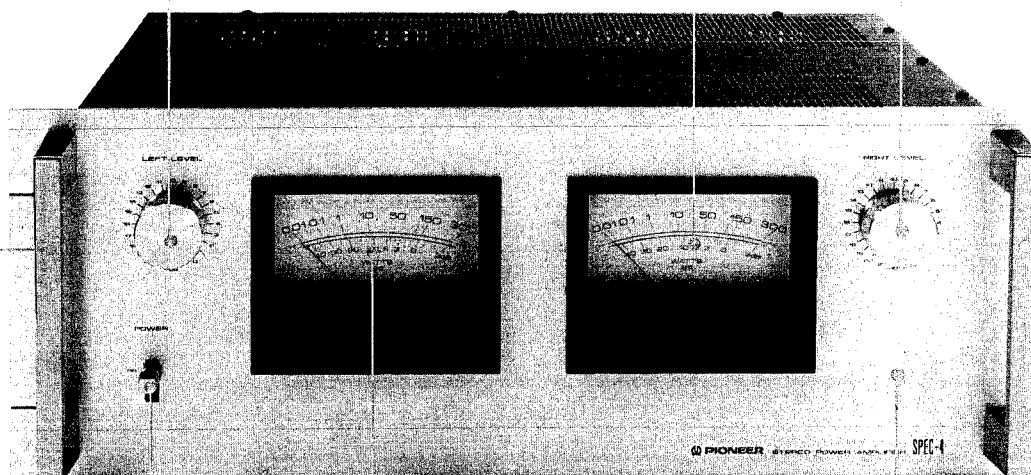
Handle  
ANK-084

Knob (LEFT LEVEL)  
AAB-153

Peak meter (RIGHT)  
AAW-068

Knob (RIGHT LEVEL)  
AAB-153

Handle  
ANK-084



Lever knob assembly (POWER)  
AAD-109

Peak meter (LEFT)  
AAW-068

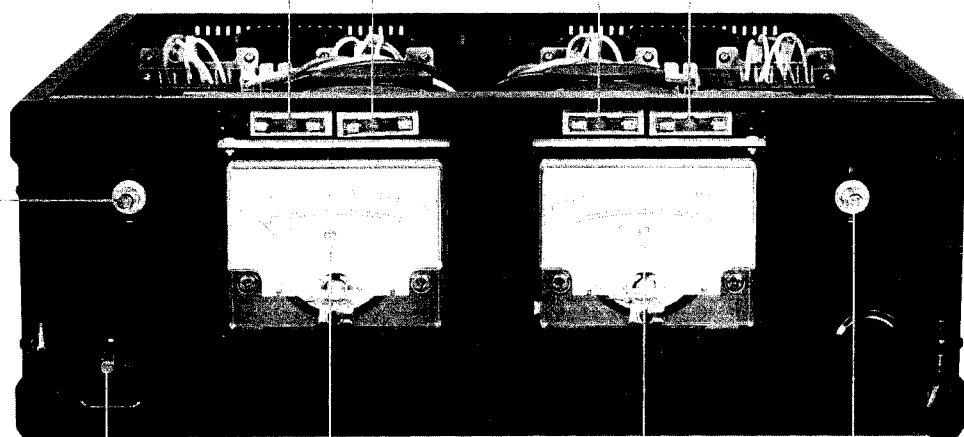
Front panel assembly  
ANB-508

### Front View with Panel Removed

Variable resistor 100k $\Omega$   
LEFT (LEVEL)  
ACV-021

Lamp (bar type) 8V, 300mA  
AEL-077

Lamp (bar type) 8V, 300mA  
AEL-077



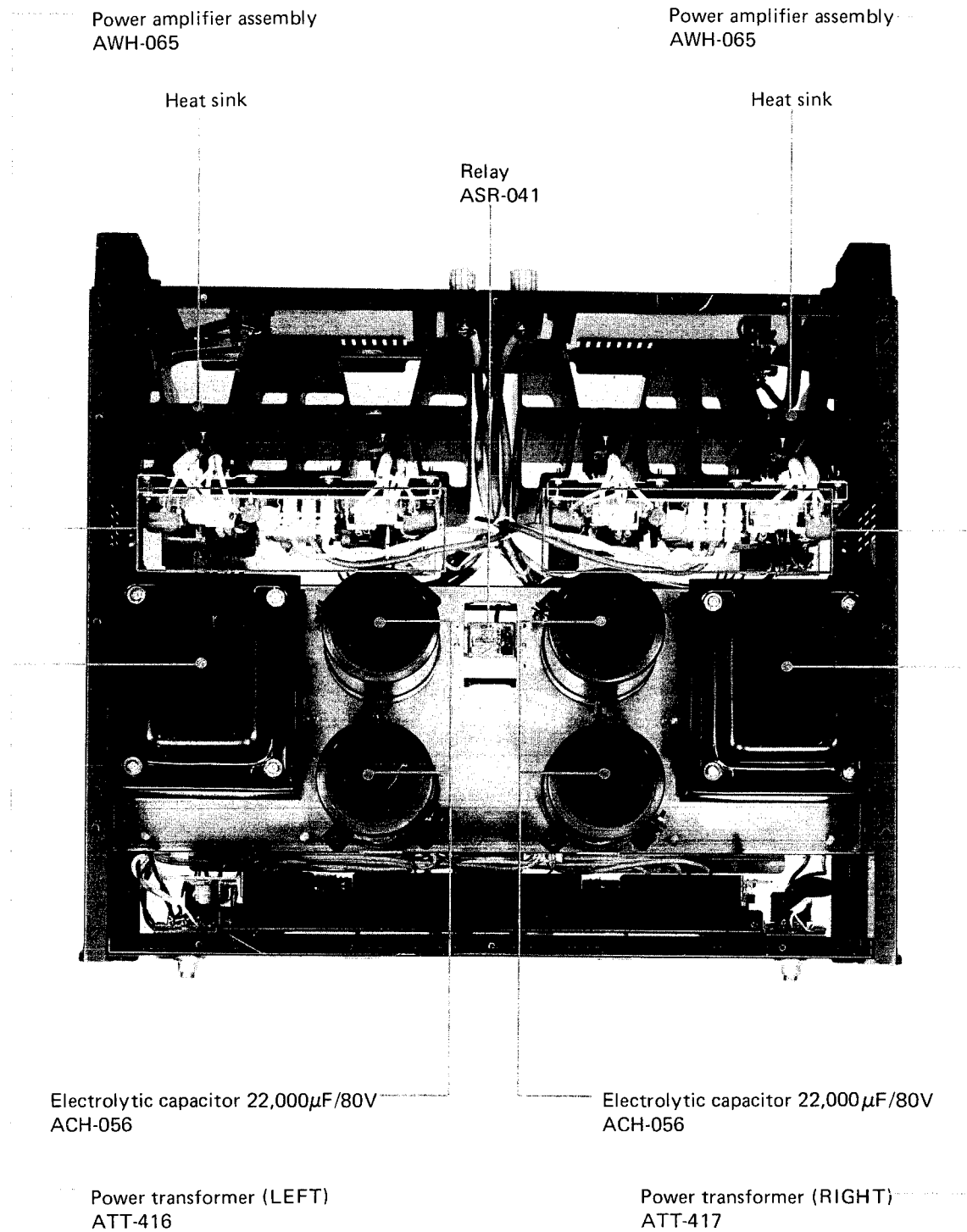
Lever switch (POWER)  
ASK-080

Peak meter (LEFT)  
AAW-068

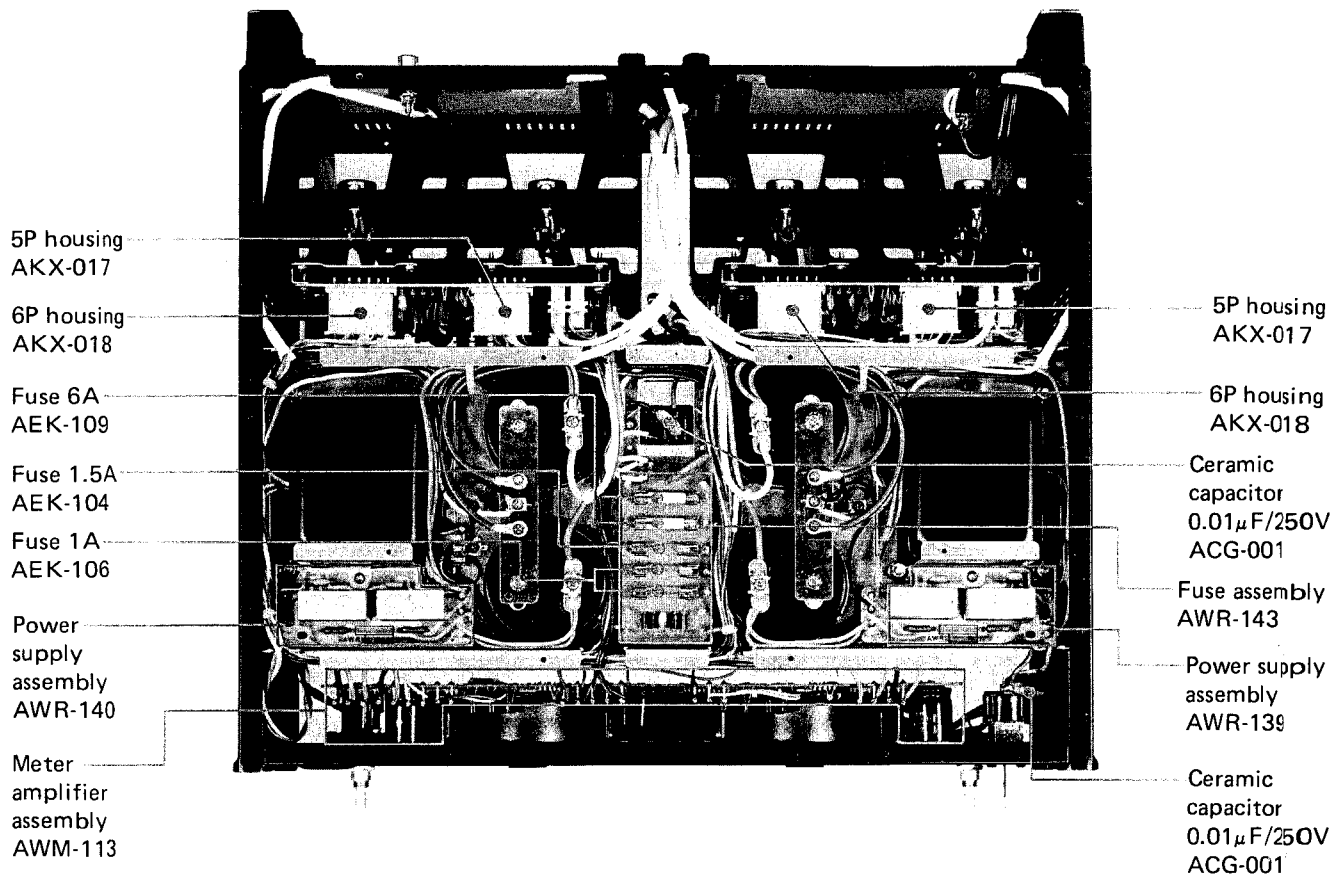
Peak meter (RIGHT)  
AAW-068

Variable resistor 100k $\Omega$  (RIGHT LEVEL)  
ACV-021

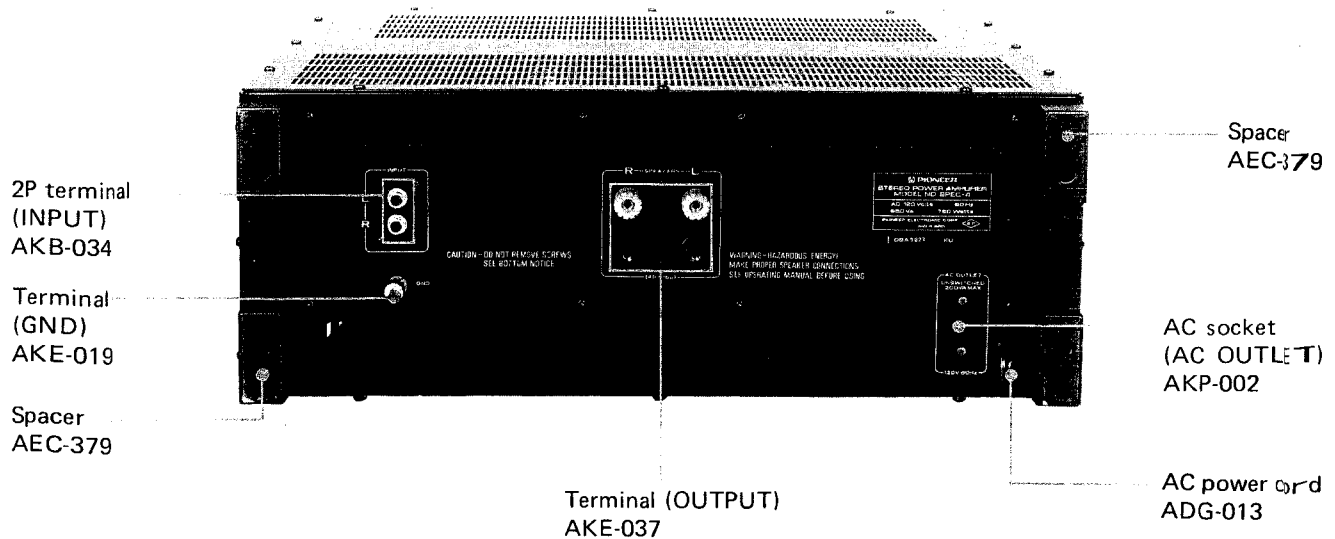
## Top View



**Bottom View**



**Rear Panel View**



## 8. ADJUSTMENTS

### 8.1 POWER AMPLIFIER

#### DC Balance Adjustment

Do not connect load to speaker output terminals. Set LEVEL control to minimum (fully counter-clockwise).

Adjust VR<sub>1</sub> for 0V at the speaker output terminals (between + and -).

#### Idle current Adjustment

Do not connect load to speaker output terminals. Set LEVEL control to minimum (fully counter-clockwise).

Adjust VR<sub>2</sub> for 50mV between terminal No. 26 (+) and No. 16 (-). Confirm that 50mV ± 10mV appears between terminals No. 25 (+) and No. 17 (-). Readjust after power has been applied for more than 10 minutes.

#### Power Limiter Adjustment

Connect a 4 ohms resistor and distortion meter, oscilloscope, and AC voltmeter to the speaker output terminals (See Fig. 11). Apply a 1kHz signal to the input terminals and adjust the input signal level for a 200W (28.29V/4Ω) output. At the same time, adjust VR<sub>3</sub>, VR<sub>4</sub> for a distortion of 0.03%. VR<sub>4</sub> adjusts the positive half cycle limiter and VR<sub>3</sub> adjusts the negative half cycle. Observe the waveform with the oscilloscope and adjust so that the waveform is symmetrical.

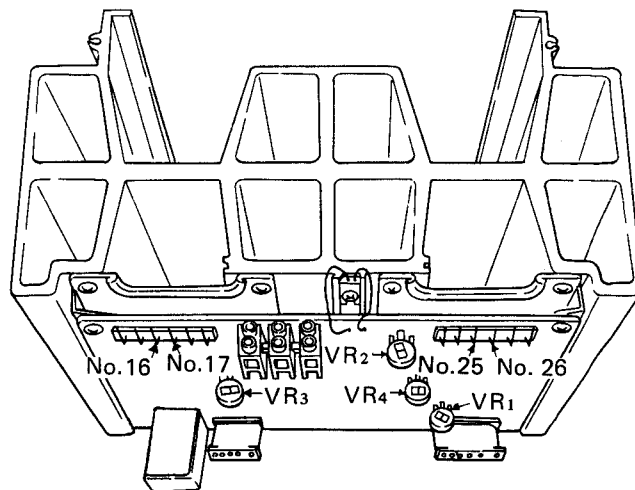


Fig. 10 Power amplifier

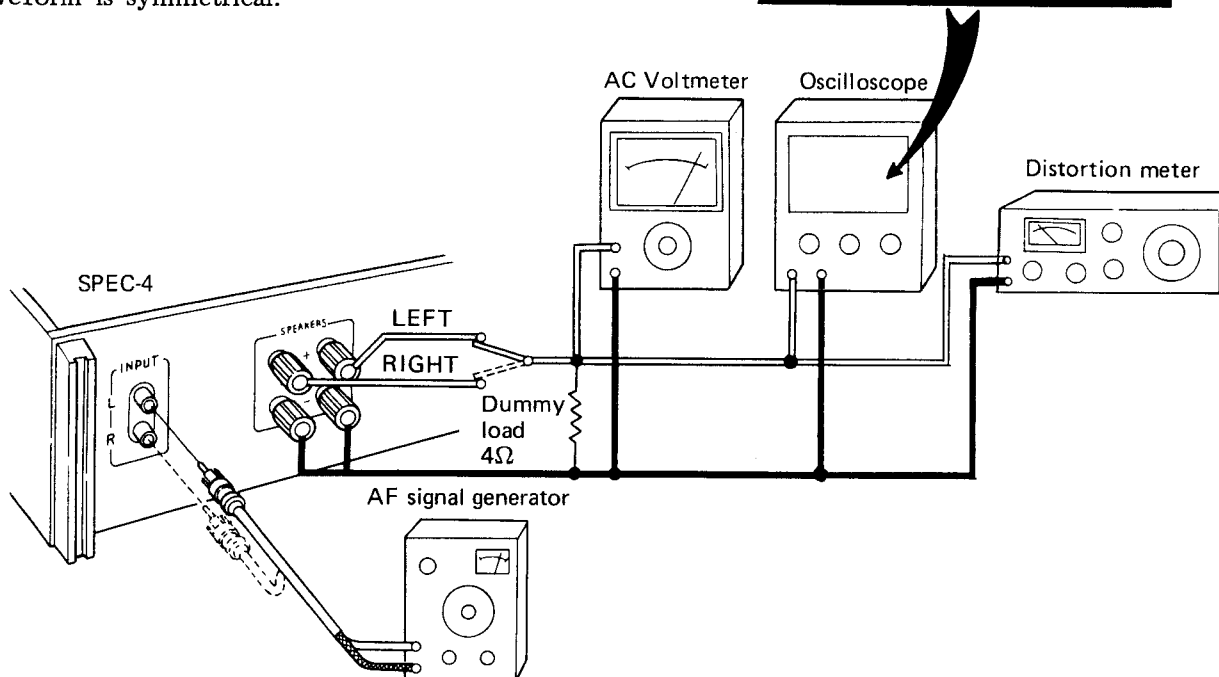
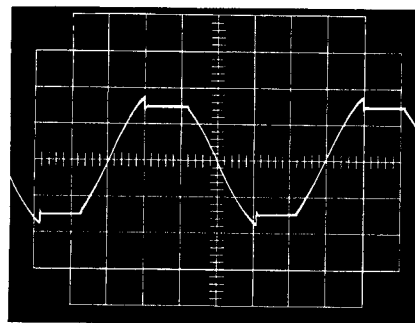


Fig. 11 Connection diagram for power limiter adjustment

## 8.2 METER AMPLIFIER

Connect an AC voltmeter to the speaker output terminals and apply a 1kHz signal to the input terminals and adjust the input signal level so that the voltmeter indicates 34.64V. At the same time, adjust VR<sub>1</sub> (R channel) and VR<sub>2</sub> (L channel) so that the output meter indicates 0dB.

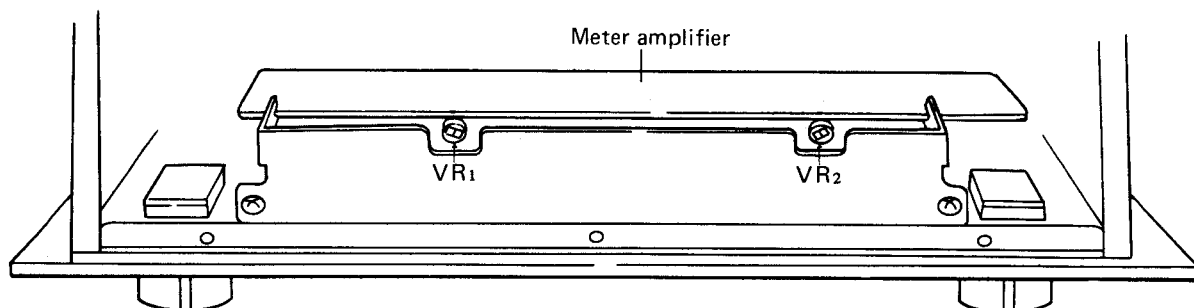


Fig. 12 The position of VR<sub>1</sub> and VR<sub>2</sub>

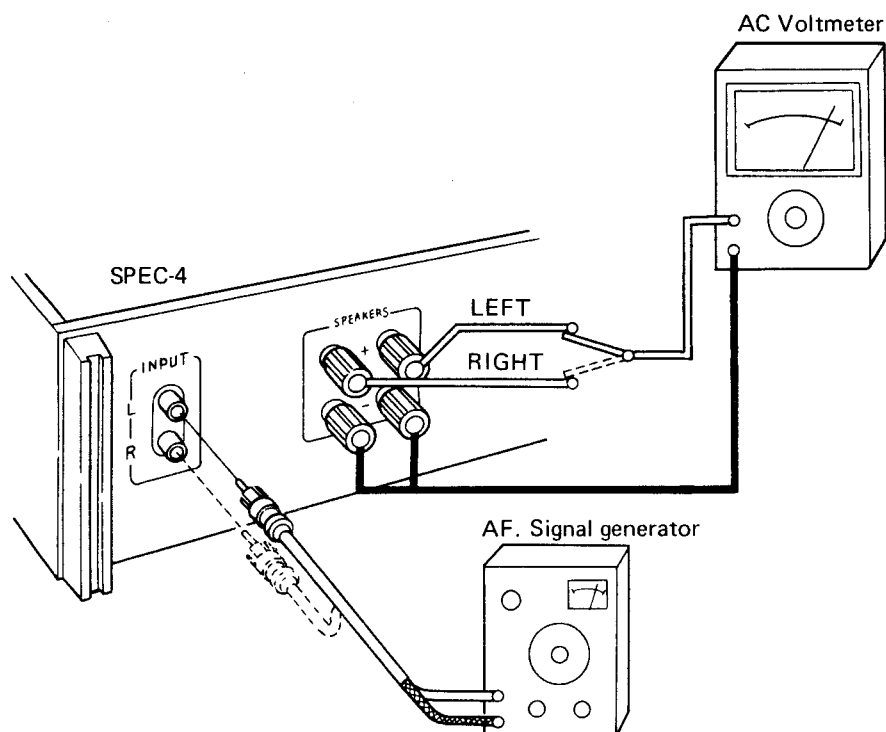


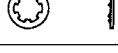
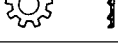
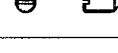
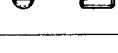
Fig. 13 Connection diagram for meter amplifier adjustment

## 9. EXPLODED VIEWS

### NOMENCLATURE OF SCREWS, WASHERS AND NUTS

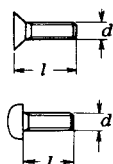
The following symbols stand for screws, washers and nuts as shown in exploded view.

| Symbol | Description                                            | Shape                                                                               |
|--------|--------------------------------------------------------|-------------------------------------------------------------------------------------|
| RT     | Brazier head tapping screw                             |    |
| PT     | Pan head tapping screw                                 |    |
| BT     | Binding head tapping screw                             |    |
| CT     | Countersunk head tapping screw                         |    |
| TT     | Truss head tapping screw                               |    |
| OCT    | Oval countersunk head tapping screw                    |    |
| PM     | Pan head machine screw                                 |    |
| CM     | Countersunk head machine screw                         |  |
| OCM    | Oval countersunk head machine screw                    |  |
| TM     | Truss head machine screw                               |  |
| BM     | Binding head machine screw                             |  |
| PSA    | Pan head screw with spring lock washer                 |  |
| PSB    | Pan head screw with spring lock washer and flat washer |  |
| PSF    | Pan head screw with flat washer                        |  |

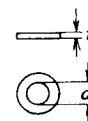
| Symbol | Description                       | Shape                                                                                 |
|--------|-----------------------------------|---------------------------------------------------------------------------------------|
| EW     | E type washer                     |    |
| FW     | Flat washer                       |    |
| SW     | Spring lock washer                |    |
| N      | Nut                               |    |
| WN     | Washer faced nut                  |    |
| ITW    | Internal toothed lock washer      |    |
| OTW    | Outernal toothed lock washer      |   |
| SC     | Slotted set screw (Cone point)    |  |
| SF     | Slotted set screw (Flat point)    |  |
| HS     | Hexagon socket headless set screw |  |
| OCW    | Oval countersunk head wood screw  |  |
| CW     | Countersunk head wood screw       |  |
| RW     | Round head wood screw             |  |
|        |                                   |                                                                                       |

#### EXAMPLE

PM • 3x8  
 — length in mm (  $l$  )  
 — diameter in mm (  $d$  )  
 — Symbol



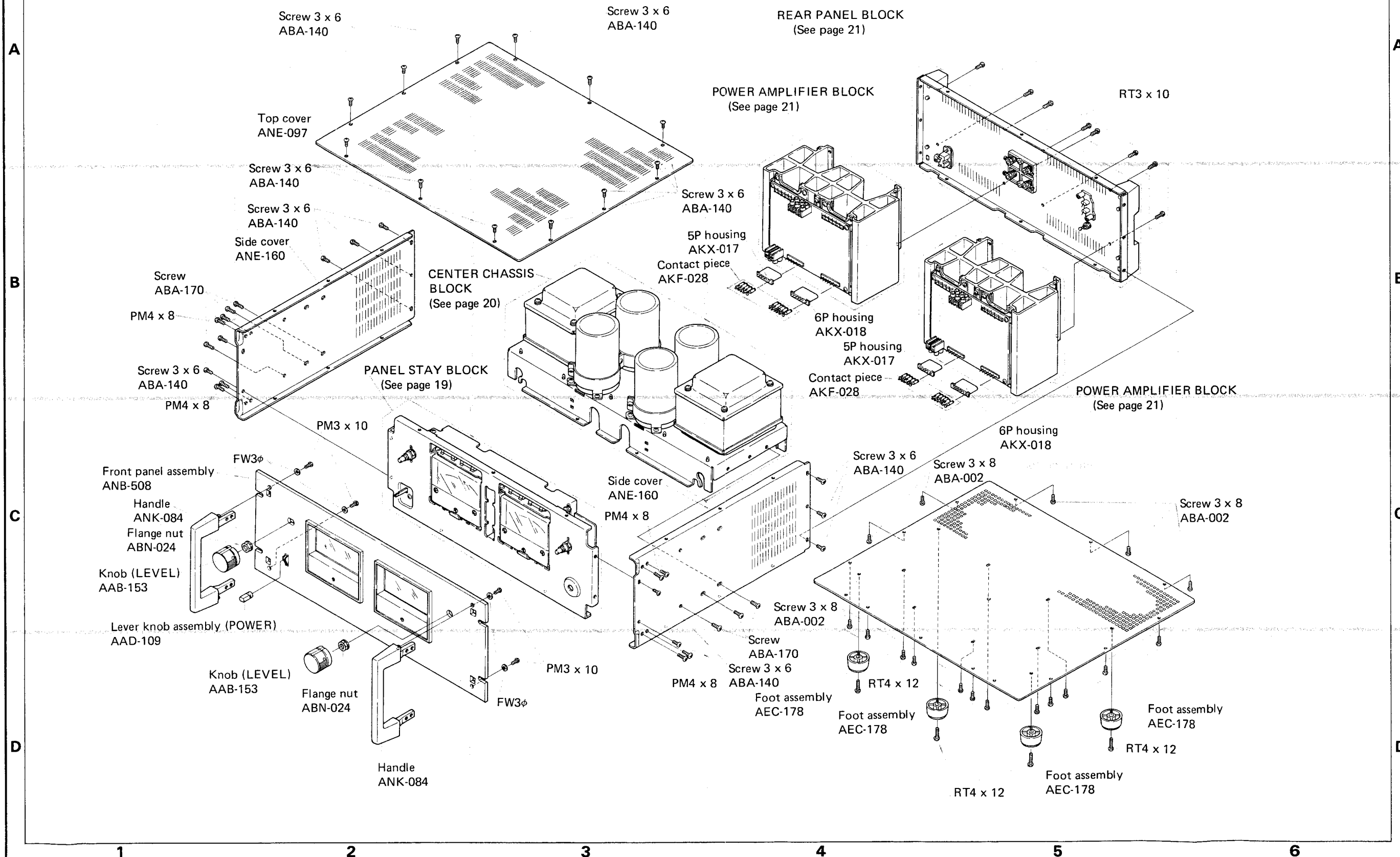
FW • 9φ x 1<sup>t</sup>  
 — thickness in mm (  $t$  )  
 — diameter in mm (  $d$  )  
 — Symbol



## 9.1 EXTERNAL PART

**NOTE:**

Parts indicated in green type cannot be supplied.



## 9.2 INTERNAL PART

### Panel Stay Block

**NOTE:**  
Parts indicated in green type cannot be supplied.

This exploded view diagram illustrates the assembly of the Panel Stay Block. The main component is a large metal plate (1) which serves as the base. Various components are shown being attached to this plate, including two peak meters (AAW-068) mounted on the left side, a meter amplifier assembly (AWM-113) on the right, and a lever switch (ASK-080) at the bottom right. A plastic board (AEC-381) is shown at the top, secured by nylon rivets (AEC-384). The assembly is held together by numerous screws (RT3 x 6, NM3, SW3φ, PM4 x 8, PM3 x 6) and union nuts (ABN-027). A ceramic capacitor (ACG-001) and two variable resistors (ACV-021) are also shown being installed. The diagram is labeled with letters A, B, C, and D along the sides and numbers 1, 2, and 3 along the top and bottom edges.

**Components and Part Numbers:**

- Nylon rivet AEC-384
- Plastic board AEC-381
- RT3 x 6
- NM3
- RT3 x 6
- SW3φ
- Lamp socket AKK-002
- Lamp (bar type) 8V, 300mA AEL-077
- Peak meter AAW-068
- Variable resistor 100kΩ (LEVEL) ACV-021
- Ceramic capacitor 0.01μF/250V ACG-001
- PM4 x 8
- Meter amplifier assembly AWM-113
- Lever switch (POWER) ASK-080
- Variable resistor 100kΩ (LEVEL) ACV-021
- Union nut ABN-027
- PM3 x 6
- Union nut ABN-027

## 9.2 INTERNAL PART

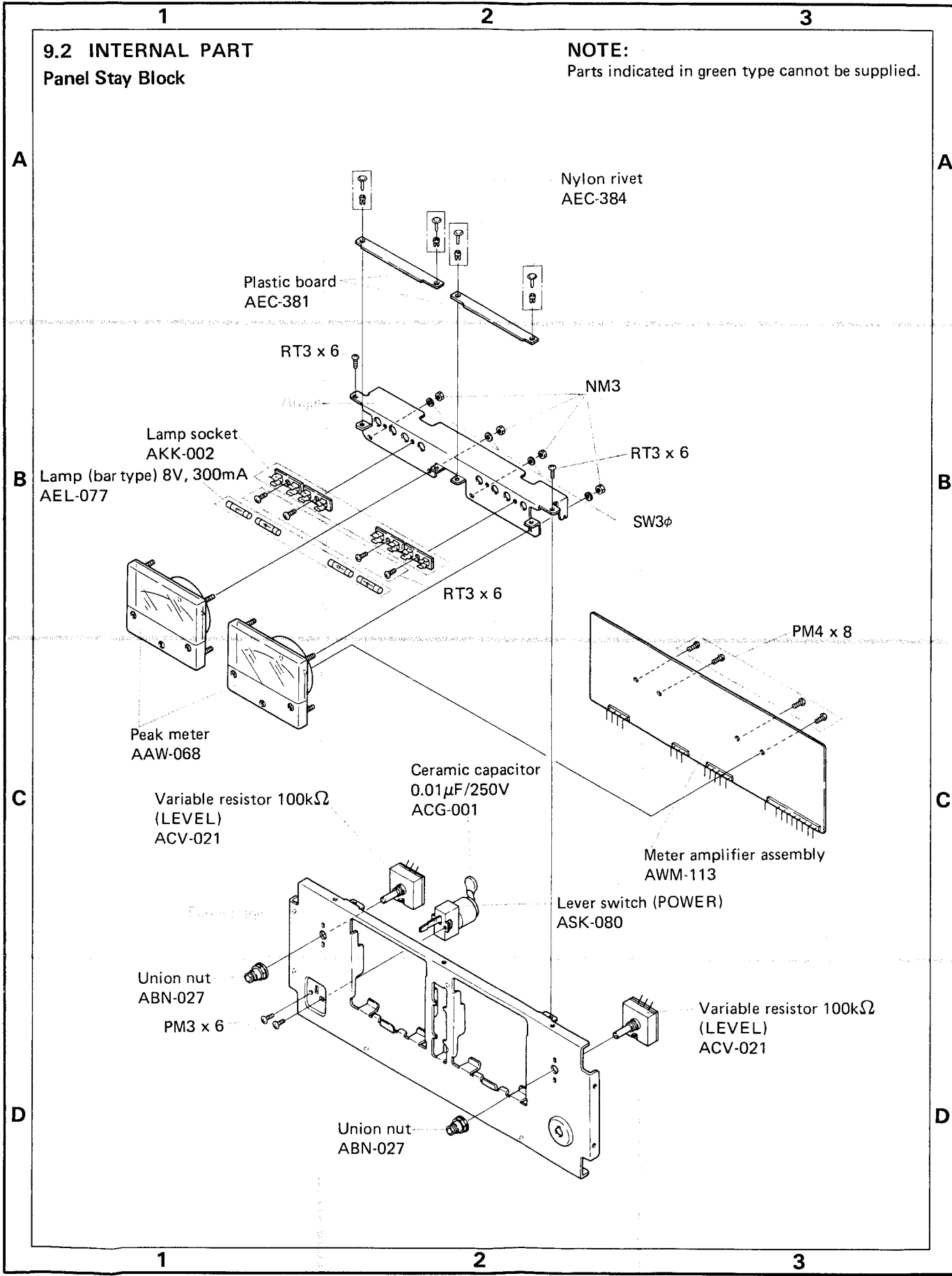
### Panel Stay Block

**NOTE:**  
Parts indicated in green type cannot be supplied.

This exploded view diagram illustrates the assembly of the Panel Stay Block. The main component is a large metal plate (1) which serves as the base. Various components are shown being attached to this plate, including two peak meters (AAW-068) and two lamp sockets (AKK-002) mounted on a plastic board (AEC-381). A meter amplifier assembly (AWM-113) and a lever switch (ASK-080) are also shown. The assembly is secured with numerous screws (RT3 x 6, NM3, SW3φ, PM4 x 8, PM3 x 6) and union nuts (ABN-027). A ceramic capacitor (ACG-001) and two variable resistors (ACV-021) are also indicated. A note specifies that parts in green type cannot be supplied.

**Components and Part Numbers:**

- Nylon rivet AEC-384
- Plastic board AEC-381
- RT3 x 6
- NM3
- RT3 x 6
- SW3φ
- Lamp socket AKK-002
- Lamp (bar type) 8V, 300mA AEL-077
- Peak meter AAW-068
- Variable resistor 100kΩ (LEVEL) ACV-021
- Ceramic capacitor 0.01μF/250V ACG-001
- Meter amplifier assembly AWM-113
- Lever switch (POWER) ASK-080
- Variable resistor 100kΩ (LEVEL) ACV-021
- Union nut ABN-027
- PM3 x 6
- Union nut ABN-027
- PM4 x 8



**Center Chassis Block**

**NOTE:**  
Parts indicated in green type cannot be supplied.

**Power transformer (L)**  
ATT-416

**Electrolytic capacitor**  
22,000 $\mu$ F/80V  
ACH-056

**RT3 x 6**

**Nut M4**  
ABN-012

**Electrolytic capacitor**  
22,000 $\mu$ F/80V  
ACH-056

**RT3 x 6**

**Nut M4**  
ABN-012

**Power transformer (R)**  
ATT-417

**P.C. board holder**

**Power supply assembly**  
AWR-139

**RT3 x 6**

**Flange nut**  
ABN-013

**Fuse assembly**  
AWR-143

**Fuse 1.5A**  
AEK-104

**Fuse 6A**  
AEK-109

**Fuse 1A**  
AEK-106

**Power supply assembly**  
AWR-140

**Relay**  
ASR-041  
(ASR-040)

**Center Chassis Block**

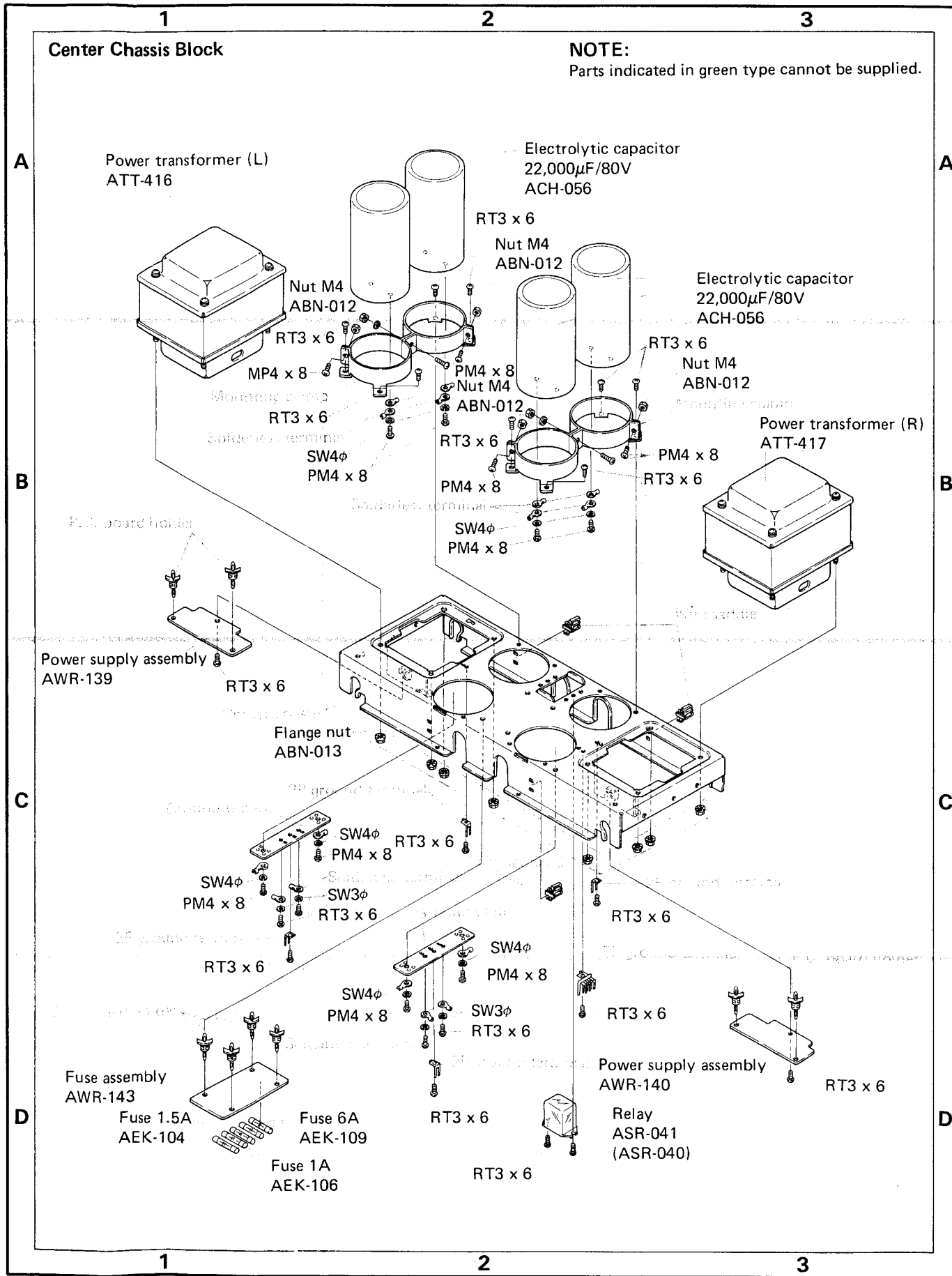
**NOTE:**  
Parts indicated in green type cannot be supplied.

The diagram illustrates the assembly of the Center Chassis Block, showing the following components and their locations:

- Power transformer (L) ATT-416**: Located at the top left.
- Electrolytic capacitor 22,000 $\mu$ F/80V ACH-056**: Two capacitors are shown, one at the top center and one at the top right.
- Power transformer (R) ATT-417**: Located at the top right.
- Power supply assembly AWR-139**: Located at the bottom left.
- Power supply assembly AWR-140**: Located at the bottom right.
- Fuse assembly AWR-143**: Located at the bottom left, containing:
  - Fuse 1.5A AEK-104**
  - Fuse 6A AEK-109**
  - Fuse 1A AEK-106**
- Relay ASR-041 (ASR-040)**: Located at the bottom right.

The diagram also shows various mounting hardware and assembly points, including:

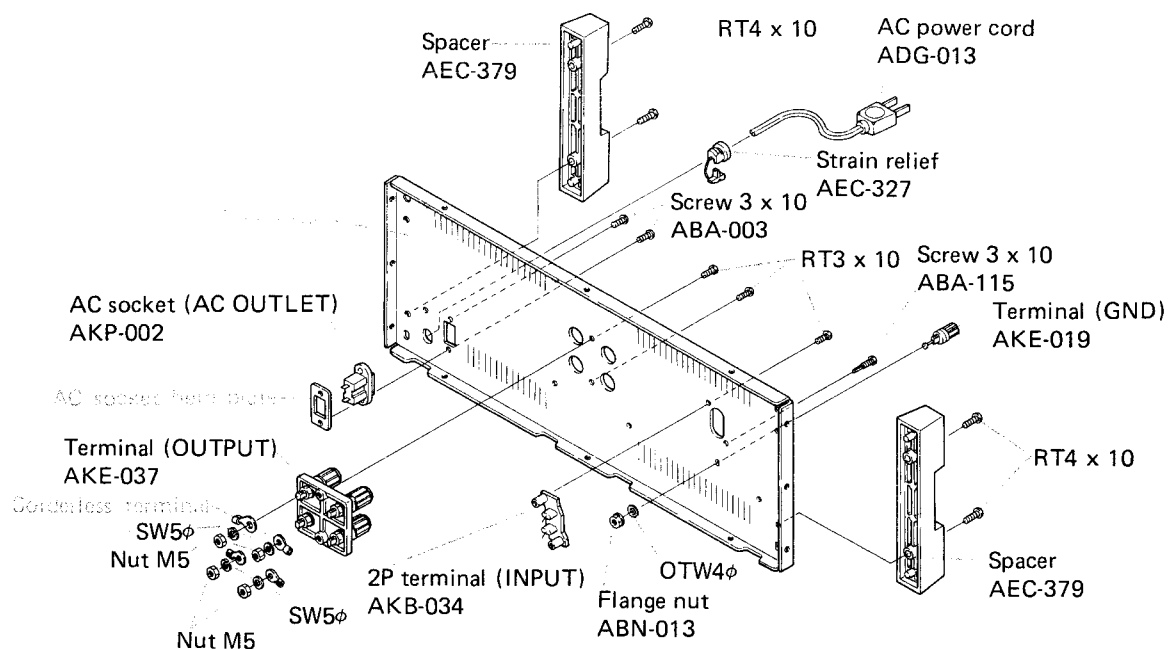
- Nut M4 ABN-012**: Multiple locations.
- RT3 x 6**: Multiple locations.
- PM4 x 8**: Multiple locations.
- SW4 $\phi$  PM4 x 8**: Multiple locations.
- SW3 $\phi$  RT3 x 6**: Multiple locations.
- Flange nut ABN-013**: Multiple locations.
- Flange nut ABN-012**: Multiple locations.
- Flange nut ABN-011**: Multiple locations.
- Flange nut ABN-010**: Multiple locations.
- Flange nut ABN-009**: Multiple locations.
- Flange nut ABN-008**: Multiple locations.
- Flange nut ABN-007**: Multiple locations.
- Flange nut ABN-006**: Multiple locations.
- Flange nut ABN-005**: Multiple locations.
- Flange nut ABN-004**: Multiple locations.
- Flange nut ABN-003**: Multiple locations.
- Flange nut ABN-002**: Multiple locations.
- Flange nut ABN-001**: Multiple locations.



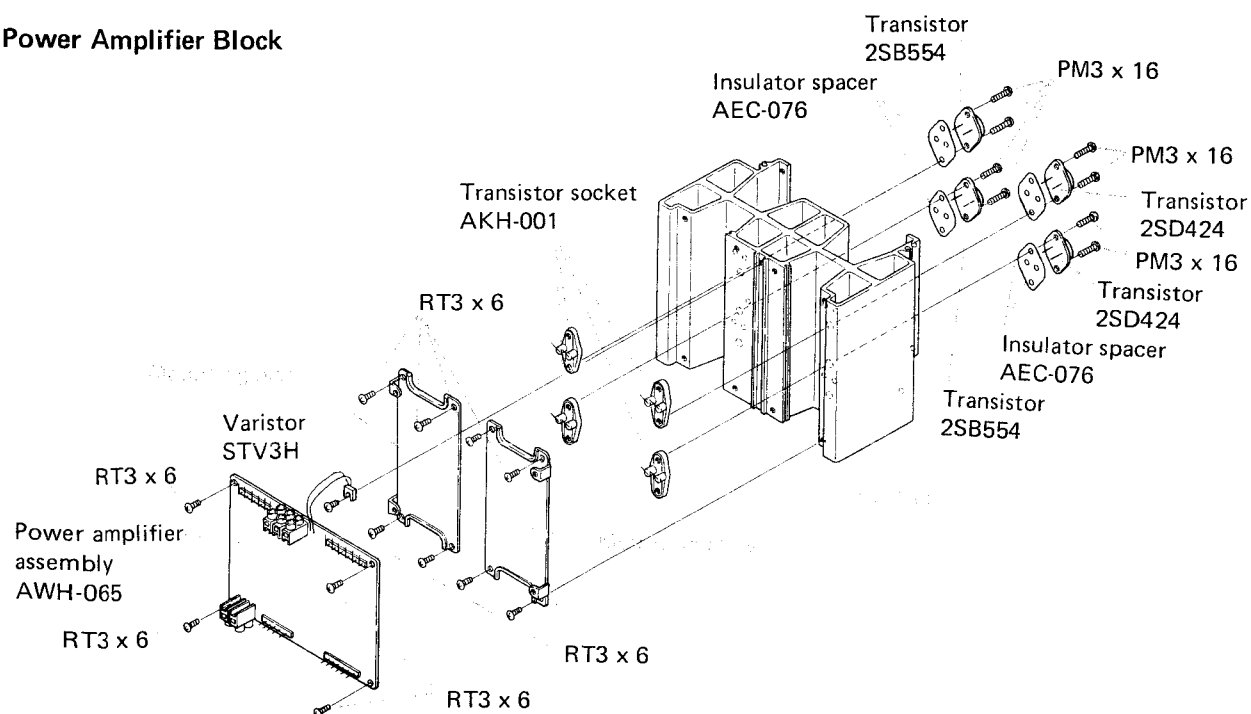
## Rear Panel Block

**NOTE:**

Parts indicated in green type cannot be supplied.



### Power Amplifier Block



# 10. SCHEMATIC DIAGRAMS, P. C. BOARD PATTERNS AND PARTS LIST

## 10.1 SCHEMATIC DIAGRAM AND MISCELLANEOUS PARTS

### Miscellaneous Parts List

#### SWITCHES

| Symbol | Description          | Part No. |
|--------|----------------------|----------|
| S1     | Lever switch (POWER) | ASK-080  |
| S2     | Relay                | ASR-041  |

#### LAMPS AND FUSES

| Symbol | Description               | Part No. |
|--------|---------------------------|----------|
| PL1    | Lamp (bar type) 8V, 300mA | AEL-077  |
| PL2    | Lamp (bar type) 8V, 300mA | AEL-077  |
| PL3    | Lamp (bar type) 8V, 300mA | AEL-077  |
| PL4    | Lamp (bar type) 8V, 300mA | AEL-077  |
| FU1    | Fuse 6A                   | AEK-109  |
| FU2    | Fuse 6A                   | AEK-109  |
| FU3    | Fuse 1.5A                 | AEK-104  |
| FU4    | Fuse 1A                   | AEK-106  |
| FU5    | Fuse 1A                   | AEK-106  |

#### TRANSFORMERS

| Symbol | Description           | Part No. |
|--------|-----------------------|----------|
| T1     | Power transformer (L) | ATT-416  |
| T2     | Power transformer (R) | ATT-417  |

#### POTENTIOMETERS

| Symbol | Description                             | Part No. |
|--------|-----------------------------------------|----------|
| VR1    | Variable resistor 100k $\Omega$ (LEVEL) | ACV-021  |
| VR2    | Variable resistor 100k $\Omega$ (LEVEL) | ACV-021  |

#### CAPACITORS

| Symbol | Description             | Part No.     |
|--------|-------------------------|--------------|
| C1     | Electrolytic 22,000 80V | ACH-056      |
| C2     | Electrolytic 22,000 80V | ACH-056      |
| C3     | Electrolytic 22,000 80V | ACH-056      |
| C4     | Electrolytic 22,000 80V | ACH-056      |
| C5     | Ceramic 0.01 250V       | ACG-001      |
| C6     | Polypropylene 33p 50V   | CQSB 330K 50 |
| C7     | Polypropylene 68p 50V   | CQSB 680K 50 |
| C8     | .....                   | .....        |
| C9     | Ceramic 0.01 250V       | ACG-001      |

#### NOTE:

- Capacitors: in  $\mu F$  unless otherwise noted p:pF
- Resistors: in  $\Omega$ ,  $\frac{1}{4}W$  unless otherwise noted k:k $\Omega$ , M:M $\Omega$

#### SEMICONDUCTORS

| Symbol | Description | Part No.                         |
|--------|-------------|----------------------------------|
| Q1     | Transistor  | 2SD424-R or O<br>(2SD555-R or S) |
| Q2     | Transistor  | 2SD424-R or O<br>(2SD555-R or S) |
| Q3     | Transistor  | 2SB554-R or O<br>(2SB600-R or S) |
| Q4     | Transistor  | 2SB554-R or O<br>(2SB600-R or S) |
| Q5     | Transistor  | 2SD424-R or O<br>(2SD555-R or S) |
| Q6     | Transistor  | 2SD424-R or O<br>(2SD555-R or S) |
| Q7     | Transistor  | 2SB554-R or O<br>(2SB600-R or S) |
| Q8     | Transistor  | 2SB554-R or O<br>(2SB600-R or S) |

\* hfe of these transistors (Q1 ~ Q8) should have the same value.

#### OTHERS

| Symbol | Description              | Part No. |
|--------|--------------------------|----------|
|        | Power amplifier assembly | AWH-065  |
|        | Meter amplifier assembly | AWM-113  |
|        | Power supply assembly    | AWR-139  |
|        | Power supply assembly    | AWR-140  |
|        | Fuse assembly            | AWR-143  |
|        | Peak meter               | AAW-068  |
|        | AC socket (AC OUTLET)    | AKP-002  |
|        | Terminal (OUTPUT)        | AKE-037  |
|        | 2P terminal (INPUT)      | AKB-034  |
|        | Termmal (GND)            | AKE-019  |
|        | 5P housing               | AKX-017  |
|        | 6P housing               | AKX-018  |
|        | Contact piece            | AKF-028  |
|        | AC power cord            | ADG-013  |
|        | Lamp socket              | AKK-002  |

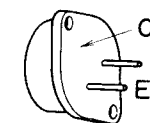
Schematic Diagram

NOTE:

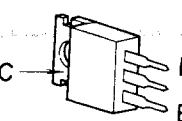
The indicated semiconductors are representative ones only. Other alternative semiconductors may be used and are listed in the parts list.

External Appearance of Transistors and IC

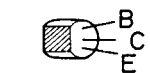
2SD424  
(2SD555)  
2SB554  
(2SB600)



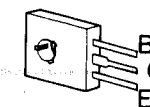
2SB628A  
2SB536  
2SD608A  
2SD381



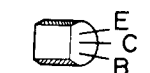
2SA858  
2SA893A  
(2SA834)  
2SC1775A  
2SC1890A  
2SC1439  
(2SC1649)  
2SA733  
2SC1904A



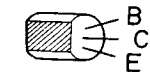
2SA899A  
2SC1904A



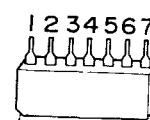
2SC869  
2SA628A



2SC1384

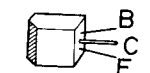


TA7136P2

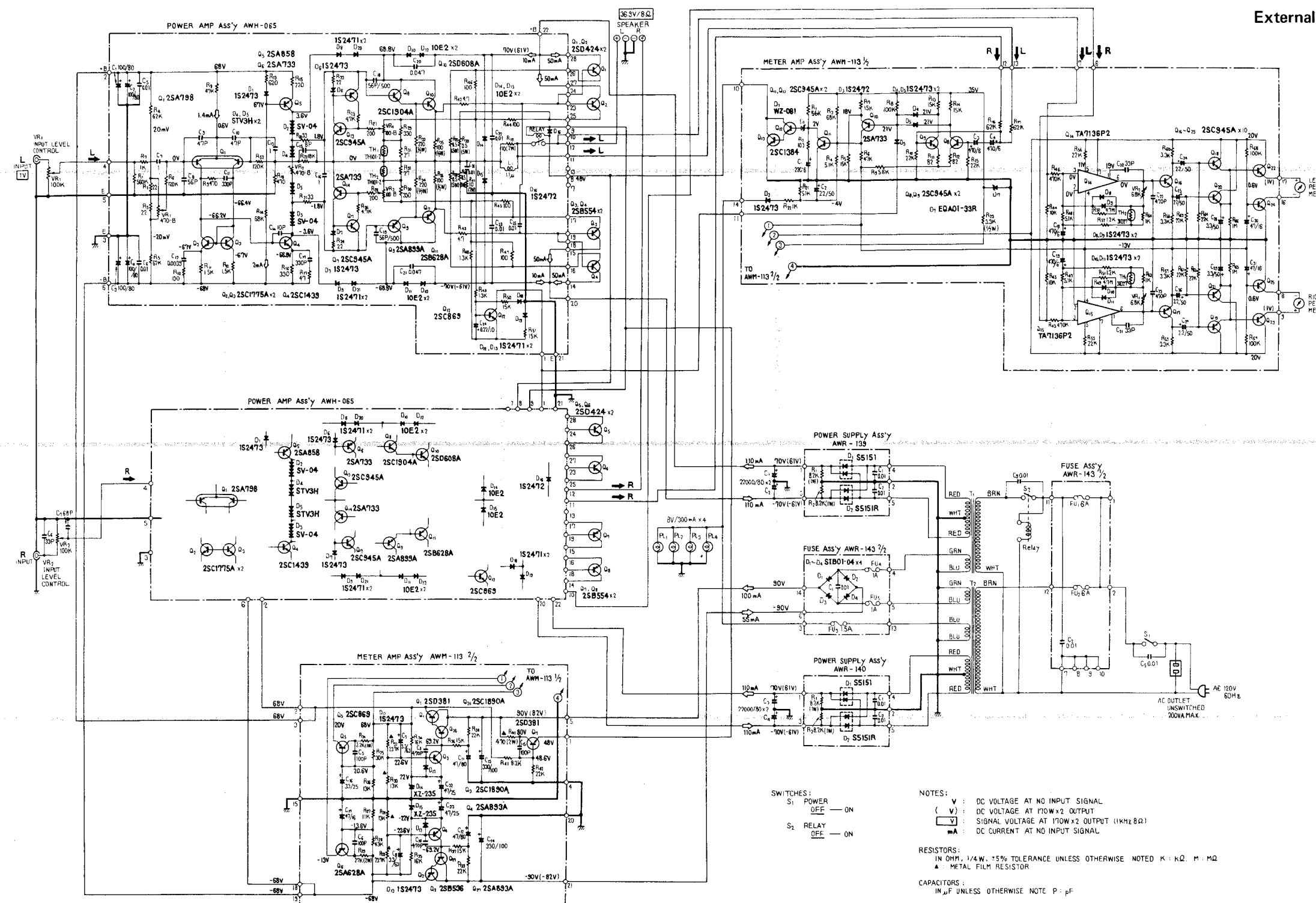
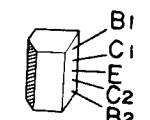


Index

(2SC1166)



2SA798



SWITCHES:  
S<sub>1</sub> POWER  
OFF — ON  
S<sub>2</sub> RELAY  
OFF — ON

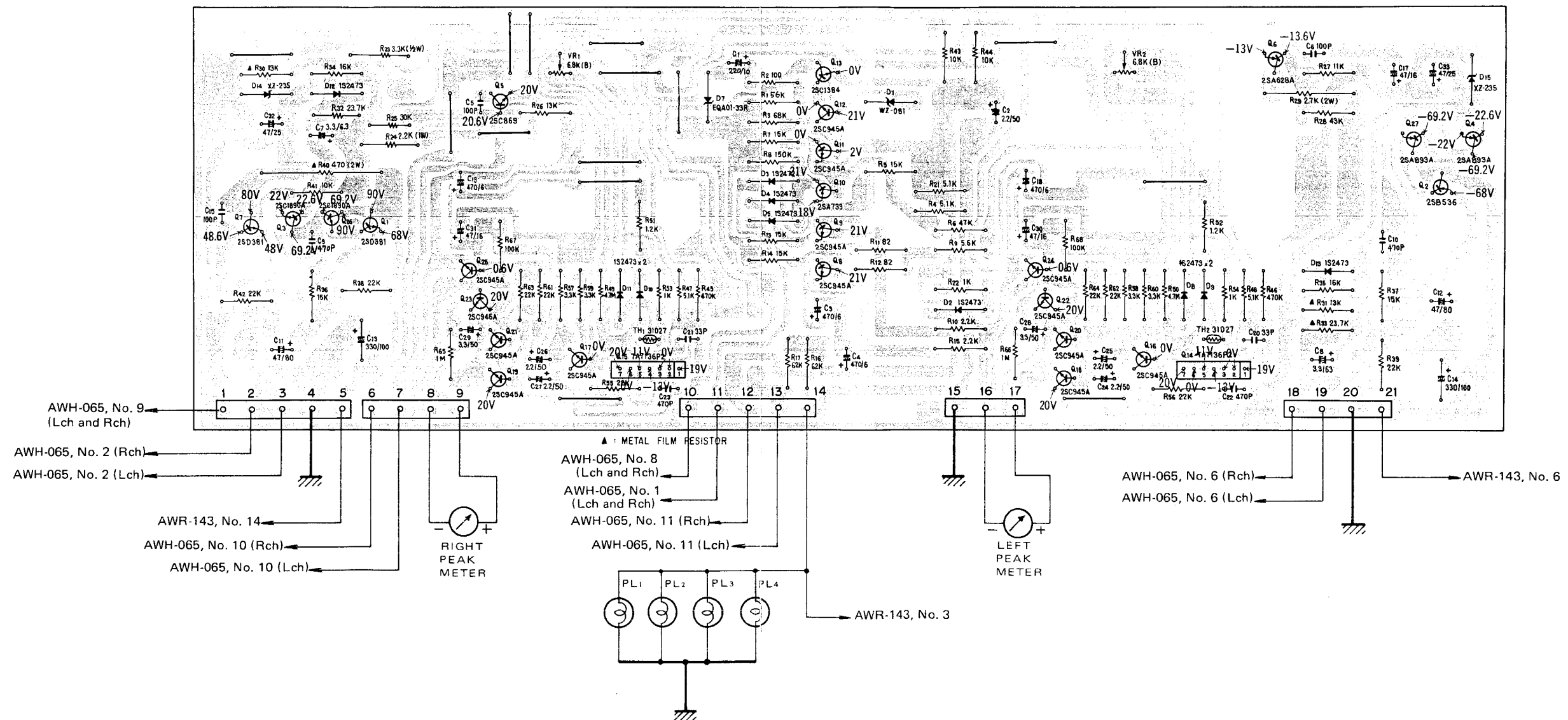
NOTES:  
V : DC VOLTAGE AT NO INPUT SIGNAL  
( V ) : DC VOLTAGE AT 170W x 2 OUTPUT  
V : SIGNAL VOLTAGE AT 170W x 2 OUTPUT (1KHz 8Ω)  
mA : DC CURRENT AT NO INPUT SIGNAL

RESISTORS:  
IN OHM, 1/4W, ±5% TOLERANCE UNLESS OTHERWISE NOTED K : KΩ, M : MΩ  
▲ : METAL FILM RESISTOR

CAPACITORS:  
IN μF UNLESS OTHERWISE NOTE P : pF

# 10.2 METER AMPLIFIER ASSEMBLY (AWM-113)

Foil side





## Parts List of Meter Amplifier Assembly (AWM-113)

### RESISTORS

| Symbol | Description           | Part No.      | Symbol | Description      | Part No.   |
|--------|-----------------------|---------------|--------|------------------|------------|
| VR1    | Semi-fixed 6.8k-B     | ACP-060       | R49    | Carbon film 4.7M | RD%PS 475J |
| VR2    | Semi-fixed 6.8k-B     | ACP-060       | R50    | Carbon film 4.7M | RD%PS 475J |
| R1     | Carbon film 56k       | RD%PS 563J    | R51    | Carbon film 1.2k | RD%PS 122J |
| R2     | Carbon film 100       | RD%PS 101J    | R52    | Carbon film 1.2k | RD%PS 122J |
| R3     | Carbon film 68k       | RD%PS 683J    | R53    | Carbon film 1k   | RD%PS 102J |
| R4     | Carbon film 5.1k      | RD%PS 512J    | R54    | Carbon film 1k   | RD%PS 102J |
| R5     | Carbon film 15k       | RD%PS 153J    | R55    | Carbon film 22k  | RD%PS 223J |
| R6     | Carbon film 47k       | RD%PS 473J    | R56    | Carbon film 22k  | RD%PS 223J |
| R7     | Carbon film 15k       | RD%PS 153J    | R57    | Carbon film 3.3k | RD%PS 332J |
| R8     | Carbon film 150k      | RD%PS 154J    | R58    | Carbon film 3.3k | RD%PS 332J |
| R9     | Carbon film 5.6k      | RD%PS 562J    | R59    | Carbon film 3.3k | RD%PS 332J |
| R10    | Carbon film 2.2k      | RD%PS 222J    | R60    | Carbon film 3.3k | RD%PS 332J |
| R11    | Carbon film 82        | RD%PS 820J    | R61    | Carbon film 22k  | RD%PS 223J |
| R12    | Carbon film 82        | RD%PS 820J    | R62    | Carbon film 22k  | RD%PS 223J |
| R13    | Carbon film 15k       | RD%PS 153J    | R63    | Carbon film 22k  | RD%PS 223J |
| R14    | Carbon film 15k       | RD%PS 153J    | R64    | Carbon film 22k  | RD%PS 223J |
| R15    | Carbon film 2.2k      | RD%PS 222J    | R65    | Carbon film 1M   | RD%PS 105J |
| R16    | Carbon film 62k       | RD%PS 623J    | R66    | Carbon film 1M   | RD%PS 105J |
| R17    | Carbon film 62k       | RD%PS 623J    | R67    | Carbon film 100k | RD%PS 104J |
| R21    | Carbon film 5.1k      | RD%PS 512J    | R68    | Carbon film 100k | RD%PS 104J |
| R22    | Carbon film 1k        | RD%PS 102J    |        |                  |            |
| R23    | Carbon film 3.3k 1/4W | RD%PSF 332J   |        |                  |            |
| R24    | Metal oxide 2.2k 1W   | RS1P 222J     |        |                  |            |
| R25    | Carbon film 30k       | RD%PS 303J    |        |                  |            |
| R26    | Carbon film 13k       | RD%PS 133J    |        |                  |            |
| R27    | Carbon film 11k       | RD%PS 113J    |        |                  |            |
| R28    | Carbon film 43k       | RD%PS 433J    |        |                  |            |
| R29    | Metal oxide 2.7k 2W   | RS2P 272J     |        |                  |            |
| R30    | Metal film 13k 1/5W   | RN1/5SQ 1302F |        |                  |            |
| R31    | Metal film 13k 1/5W   | RN1/5SQ 1302F |        |                  |            |
| R32    | Metal film 23.7k 1/5W | RN1/5SQ 2372F |        |                  |            |
| R33    | Metal film 23.7k 1/5W | RN1/5SQ 2372F |        |                  |            |
| R34    | Carbon film 16k       | RD%PS 163J    |        |                  |            |
| R35    | Carbon film 16k       | RD%PS 163J    |        |                  |            |
| R36    | Carbon film 15k       | RD%PS 153J    |        |                  |            |
| R37    | Carbon film 15k       | RD%PS 153J    |        |                  |            |
| R38    | Carbon film 22k       | RD%PS 223J    |        |                  |            |
| R39    | Carbon film 22k       | RD%PS 223J    |        |                  |            |
| R40    | Metal oxide 470 2W    | RS2P 471J     |        |                  |            |
| R41    | Carbon film 8.2k      | RD%PS 822J    |        |                  |            |
| R42    | Carbon film 22k       | RD%PS 223J    |        |                  |            |
| R43    | Carbon film 10k       | RD%PS 103J    |        |                  |            |
| R44    | Carbon film 10k       | RD%PS 103J    |        |                  |            |
| R45    | Carbon film 470k      | RD%PS 474J    |        |                  |            |
| R46    | Carbon film 470k      | RD%PS 474J    |        |                  |            |
| R47    | Carbon film 5.1k      | RD%PS 512J    |        |                  |            |
| R48    | Carbon film 5.1k      | RD%PS 512J    |        |                  |            |

### CAPACITORS

| Symbol | Description           | Part No.      |
|--------|-----------------------|---------------|
| C1     | Electrolytic 220 10V  | CEA 221P 10   |
| C2     | Electrolytic 2.2 50V  | ACH-317       |
| C3     | Electrolytic 470 6V   | CEA 471P 6    |
| C4     | Electrolytic 470 6V   | CEA 471P 6    |
| C5     | Ceramic 100p 50V      | CCDSL 101K 50 |
| C6     | Ceramic 100p 50V      | CCDSL 101K 50 |
| C7     | Electrolytic 3.3 63V  | CEA 3R3P 63   |
| C8     | Electrolytic 3.3 63V  | CEA 3R3P 63   |
| C9     | Ceramic 470p 50V      | CKDYB 471K 50 |
| C10    | Ceramic 470p 50V      | CKDYB 471K 50 |
| C11    | Electrolytic 47 80V   | CEA 470P 80   |
| C12    | Electrolytic 47 80V   | CEA 470P 80   |
| C13    | Electrolytic 330 100V | ACH-076       |
| C14    | Electrolytic 330 100V | ACH-076       |
| C15    | Ceramic 100p 50V      | CCDSL 101K 50 |
| C16    | Electrolytic 33 25V   | CEA 330P 25   |
| C17    | Electrolytic 47 16V   | CEA 470P 16   |
| C18    | Electrolytic 470 6V   | CEA 471P 6    |
| C19    | Electrolytic 470 6V   | CEA 471P 6    |
| C20    | Ceramic 33p 50V       | CCDSL 330K 50 |
| C21    | Ceramic 33p 50V       | CCDSL 330K 50 |
| C22    | Ceramic 470p 50V      | CKDYB 471K 50 |
| C23    | Ceramic 470p 50V      | CKDYB 471K 50 |
| C24    | Electrolytic 2.2 50V  | CEA 2R2P 50   |
| C25    | Electrolytic 2.2 50V  | CEA 2R2P 50   |

| Symbol | Description  |     |     |             | Part No. | Symbol     | Description | Part No.    |
|--------|--------------|-----|-----|-------------|----------|------------|-------------|-------------|
| C26    | Electrolytic | 2.2 | 50V | CEA 2R2P 50 | Q13      | Transistor | 2SC1384-R   |             |
| C27    | Electrolytic | 2.2 | 50V | CEA 2R2P 50 |          |            | (2SC1384-Q) |             |
| C28    | Electrolytic | 3.3 | 50V | CEA 3R3P 50 |          |            | (2SC1166-Y) |             |
| C29    | Electrolytic | 3.3 | 50V | CEA 3R3P 50 |          |            | (2SC1166-O) |             |
| C30    | Electrolytic | 47  | 16V | CEA 470P 16 |          |            |             |             |
| C31    | Electrolytic | 47  | 16V | CEA 470P 16 | Q14      | IC         | TA7136P2    |             |
|        |              |     |     |             | Q15      | IC         | TA7136P2    |             |
| C32    | Electrolytic | 47  | 25V | CEA 470P 25 | Q16      | Transistor | 2SC945A-Q   |             |
| C33    | Electrolytic | 47  | 25V | CEA 470P 25 | Q17      | Transistor | 2SC945A-R   |             |
|        |              |     |     |             |          |            |             | (2SC945A-Q) |
|        |              |     |     |             |          |            | (2SC945A-R) |             |

## SEMICONDUCTORS

| Symbol | Description | Part No.                                               |     |             |                                                        |
|--------|-------------|--------------------------------------------------------|-----|-------------|--------------------------------------------------------|
| Q1     | Transistor  | 2SD381-N<br>(2SD381-M)<br>(2SD381-L)                   | Q20 | Transistor  | (2SC945A-R)<br>2SC945A-Q<br>(2SC945A-R)                |
| Q2     | Transistor  | 2SB536-N<br>(2SB536-M)<br>(2SB536-L)                   | Q21 | Transistor  | 2SC945A-Q<br>(2SC945A-R)                               |
|        |             |                                                        | Q22 | Transistor  | 2SC945A-Q<br>(2SC945A-R)                               |
| Q3     | Transistor  | 2SC1890A-E<br>(2SC1890A-F)<br>(2SC869-D)<br>(2SC869-C) | Q23 | Transistor  | 2SC945A-Q<br>(2SC945A-R)                               |
|        |             |                                                        | Q24 | Transistor  | 2SC945A-Q<br>(2SC945A-R)                               |
| Q4     | Transistor  | 2SA893A-D<br>(2SA893A-E)<br>(2SA628A-D)<br>(2SA628A-C) | Q25 | Transistor  | 2SC945A-Q<br>(2SC945A-R)                               |
|        |             |                                                        | Q26 | Transistor  | 2SC1890A-E<br>(2SC1890A-F)<br>(2SC869-D)<br>(2SC869-C) |
| Q5     | Transistor  | 2SC869-D<br>(2SC869-C)<br>(2SC1649-N)<br>(2SC1649-M)   | Q27 | Transistor  | 2SA893A-D<br>(2SA893A-E)<br>(2SA628A-D)<br>(2SA628A-C) |
| Q6     | Transistor  | 2SA628A-D<br>(2SA628A-C)<br>(2SA834-N)<br>(2SA834-M)   | D1  | Zener diode | WZ-081                                                 |
|        |             |                                                        | D2  | Diode       | 1S2473<br>(1S1555)                                     |
| Q7     | Transistor  | 2SD381-L                                               | D3  | Diode       | 1S2472<br>(1S1554)                                     |
|        |             |                                                        | D4  | Diode       | 1S2473<br>(1S1555)                                     |
| Q8     | Transistor  | 2SC945A-Q<br>(2SC945A-R)                               | D5  | Diode       | 1S2473<br>(1S1555)                                     |
| Q9     | Transistor  | 2SC945A-Q<br>(2SC945A-R)                               | D7  | Diode       | EQA01-33R<br>(1S1554)                                  |
| Q10    | Transistor  | 2SA733-Q<br>(2SA733-R)                                 | D8  | Diode       | 1S2473<br>(1S1555)                                     |
| Q11    | Transistor  | 2SC945A-Q<br>(2SC945A-R)                               | D9  | Diode       | 1S2473<br>(1S1555)                                     |
| Q12    | Transistor  | 2SC945A-Q<br>(2SC945A-R)                               | D10 | Diode       | 1S2473<br>(1S1555)                                     |

\* hfe of these transistors (Q8, Q9, Q11, Q12) should have the same value.

| <u>Symbol</u> | <u>Description</u> | <u>Part No.</u>    |
|---------------|--------------------|--------------------|
| D12           | Diode              | 1S2473<br>(1S1555) |
| D13           | Diode              | 1S2473<br>(1S1555) |
| D14           | Zener diode        | XZ-235             |
| D15           | Zener diode        | XZ-235             |
| TH1           | Thermistor         | 31D27              |
| TH2           | Thermistor         | 31D27              |

## OTHER

| <u>Symbol</u> | <u>Description</u> | <u>Part No.</u> |
|---------------|--------------------|-----------------|
|               | Heat sink          | ANH-117         |

### List of Changed Parts for Ractory Modification

| Symbol | Description | Part No. |
|--------|-------------|----------|
|        |             |          |

10.3 POWER AMPLIFIER ASSEMBLY (AWH-065)

Foil side

AWR-139, No. 1 (AWR-140, No. 1 for Rch)

AWR-139, No. 3 (AWR-140, No. 3 for Rch)

2SD424

2SD424

2SB554

2SB554

1S2471 x 2

1S2471

1S2472

1S2473

1S2474

1S2475

1S2476

1S2477

1S2478

1S2479

1S2480

1S2481

1S2482

1S2483

1S2484

1S2485

1S2486

1S2487

1S2488

1S2489

1S2490

1S2491

1S2492

1S2493

1S2494

1S2495

1S2496

1S2497

1S2498

1S2499

1S2500

2SC945A

2SC1904A

2SC1775A

2SC1439

2SC1438

2SC1437

2SC1436

2SC1435

2SC1434

2SC1433

2SC1432

2SC1431

2SC1430

2SC1429

2SC1428

2SC1427

2SC1426

2SC1425

2SC1424

2SC1423

2SC1422

2SC1421

2SC1420

2SC1419

2SC1418

2SC1417

2SC1416

2SC1415

2SC1414

2SC1413

2SC1412

2SC1411

2SC1410

2SC1409

2SC1408

2SC1407

2SC1406

2SC1405

2SC1404

2SC1403

2SC1402

2SC1401

2SC1400

2SC1399

2SC1398

2SC1397

2SC1396

2SC1395

2SC1394

2SC1393

2SC1392

2SC1391

2SC1390

2SC1389

2SC1388

2SC1387

2SC1386

2SC1385

2SC1384

2SC1383

2SC1382

2SC1381

2SC1380

2SC1379

2SC1378

2SC1377

2SC1376

2SC1375

2SC1374

2SC1373

2SC1372

2SC1371

2SC1370

2SC1369

2SC1368

2SC1367

2SC1366

2SC1365

2SC1364

2SC1363

2SC1362

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2SC1360

2SC1359

2SC1358

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2SC1308

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2SC1305

2SC1304

2SC1303

2SC1302

2SC1301

2SC1300

2SC1299

2SC1298

2SC1297

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2SC1280

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2SC1278

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2SC1275

2SC1274

2SC1273

2SC1272

2SC1271

2SC1270

2SC1269

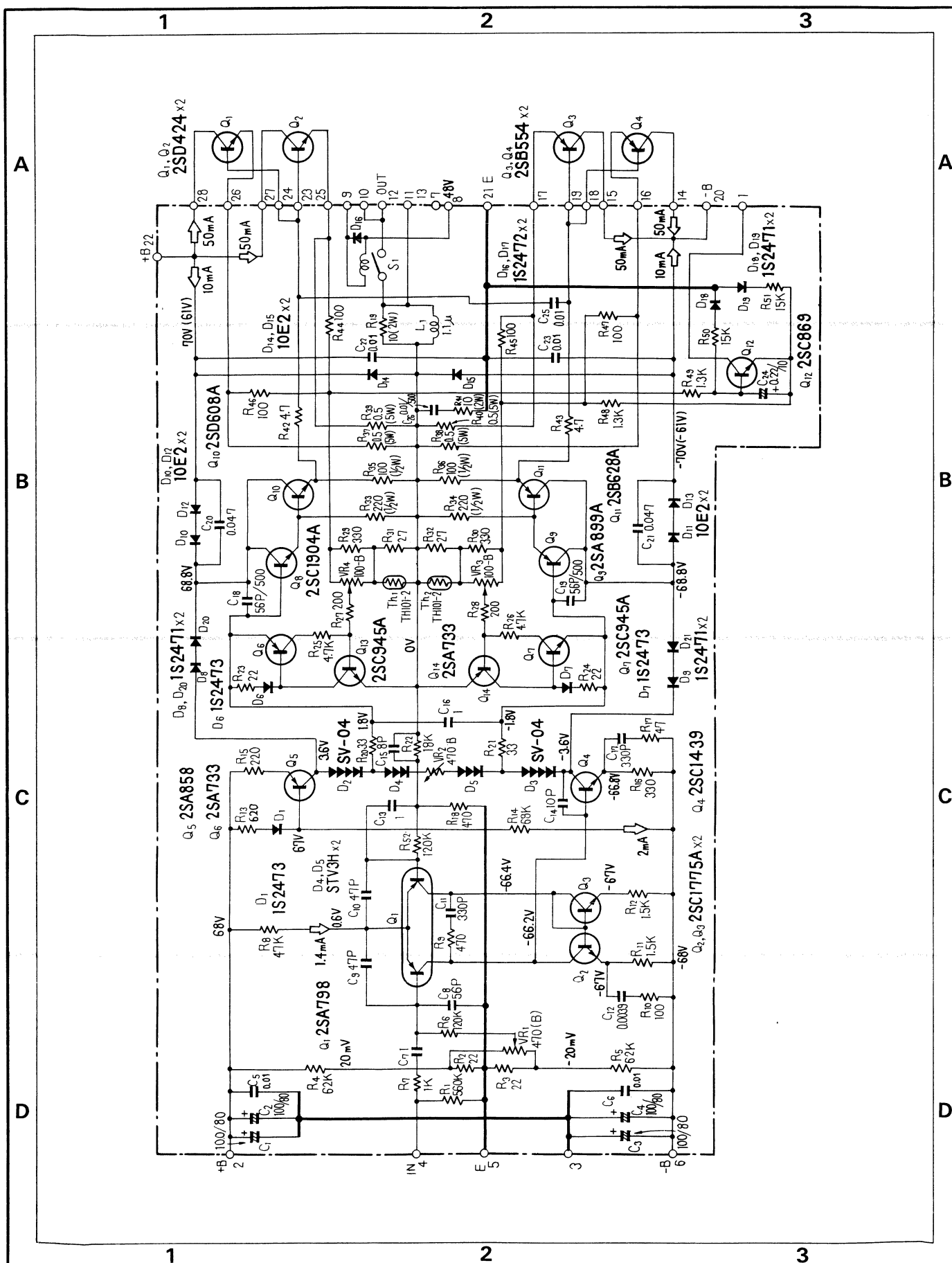
2SC1268

2SC1267

2SC1266

2SC1265

2SC126



## Parts List of Power Amplifier Assembly (AWH-065)

### RESISTORS AND POTENTIOMETERS

| Symbol | Description        | Part No.    |
|--------|--------------------|-------------|
| TH1    | Thermistor         | TH101-2     |
| TH2    | Thermistor         | TH101-2     |
| VR1    | Semi-fixed 470-B   | ACP-033     |
| VR2    | Semi-fixed 470-B   | ACP-033     |
| VR3    | Semi-fixed 100-B   | ACP-032     |
| VR4    | Semi-fixed 100-B   | ACP-032     |
| R1     | Carbon film 560k   | RD½PS 564J  |
| R2     | Carbon film 22     | RD½PS 220J  |
| R3     | Carbon film 22     | RD½PS 220J  |
| R4     | Carbon film 62k    | RD½PS 623J  |
| R5     | Carbon film 62k    | RD½PS 623J  |
| R6     | Carbon film 120k   | RD½PS 124J  |
| R7     | Carbon film 1k     | RD½PS 102J  |
| R8     | Carbon film 47k    | RD½PS 473J  |
| R9     | Carbon film 470    | RD½PS 471J  |
| R10    | Carbon film 100    | RD½PS 101J  |
| R11    | Carbon film 1.5k   | RD½PSF 152J |
| R12    | Carbon film 1.5k   | RD½PSF 152J |
| R13    | Carbon film 620    | RD½PSF 621J |
| R14    | Carbon film 68k    | RD½PS 683J  |
| R15    | Carbon film 220    | RD½PSF 221J |
| R16    | Carbon film 330    | RD½PSF 331J |
| R17    | Carbon film 47     | RD½PS 470J  |
| R18    | Carbon film 470    | RD½PS 471J  |
| R19    | Metal oxide 10 2W  | RS2P 100J   |
| R20    | Carbon film 33     | RD½PSF 330J |
| R21    | Carbon film 33     | RD½PSF 330J |
| R22    | Carbon film 18k    | RD½PS 183J  |
| R23    | Carbon film 22     | RD½PSF 220J |
| R24    | Carbon film 22     | RD½PSF 220J |
| R25    | Carbon film 4.7k   | RD½PS 472J  |
| R26    | Carbon film 4.7k   | RD½PS 472J  |
| R27    | Carbon film 200    | RD½PSF 201J |
| R28    | Carbon film 200    | RD½PSF 201J |
| R29    | Carbon film 330    | RD½PSF 331J |
| R30    | Carbon film 330    | RD½PSF 331J |
| R31    | Carbon film 27     | RD½PS 270J  |
| R32    | Carbon film 27     | RD½PS 270J  |
| R33    | Carbon film 220 ½W | RD½PSF 221J |
| R34    | Carbon film 220 ½W | RD½PSF 221J |
| R35    | Carbon film 100 ½W | RD½PSF 101J |
| R36    | Carbon film 100 ½W | RD½PSF 101J |
| R37    | Wire wound 0.5 5W  | RT5B 0R5K   |
| R38    | Wire wound 0.5 5W  | RT5B 0R5K   |
| R39    | Wire wound 0.5 5W  | RT5B 0R5K   |
| R40    | Wire wound 0.5 5W  | RT5B 0R5K   |

| Symbol | Description       | Part No.    |
|--------|-------------------|-------------|
| R41    | Metal oxide 10 2W | RS2P 100J   |
| R42    | Carbon film 4.7   | RD½PSF 4R7J |
| R43    | Carbon film 4.7   | RD½PSF 4R7J |
| R44    | Carbon film 100   | RD½PSF 101J |
| R45    | Carbon film 100   | RD½PSF 101J |
| R46    | Carbon film 100   | RD½PSF 101J |
| R47    | Carbon film 100   | RD½PSF 101J |
| R48    | Carbon film 1.3k  | RD½PS 132J  |
| R49    | Carbon film 1.3k  | RD½PS 132J  |
| R50    | Carbon film 15k   | RD½PS 153J  |
| R51    | Carbon film 15k   | RD½PS 153J  |
| R52    | Carbon film 120k  | RD½PS 124J  |

### CAPACITORS

| Symbol | Description           | Part No.       |
|--------|-----------------------|----------------|
| C1     | Electrolytic 100 80V  | CEA 101P 80    |
| C2     | Electrolytic 100 80V  | CEA 101P 80    |
| C3     | Electrolytic 100 80V  | CEA 101P 80    |
| C4     | Electrolytic 100 80V  | CEA 101P 80    |
| C5     | Ceramic 0.01 150V     | ACG-004        |
| C6     | Ceramic 0.01 150V     | ACG-004        |
| C7     | Polyester 1 250V      | CQEA 105K 250  |
| C8     | Polystyrene 56p 50V   | CQSH 560K 50   |
| C9     | Ceramic 47p 50V       | CCDSL 470K 50  |
| C10    | Ceramic 47p 50V       | CCDSL 470K 50  |
| C11    | Ceramic 330p 50V      | CKDYB 331K 50  |
| C12    | Ceramic 3900p 50V     | CKDYB 392K 50  |
| C13    | Polyester 1 250V      | CQEA 105K 250  |
| C14    | Ceramic 10p 50V       | CCDSL 100F 50  |
| C15    | Ceramic 8p 50V        | CCDSL 080F 50  |
| C16    | Polyester 1 250V      | CQEA 105K 250  |
| C17    | Ceramic 330p 50V      | CKDYB 331K 50  |
| C18    | Ceramic 56p 500V      | CCDSL 560K 500 |
| C19    | Ceramic 56p 500V      | CCDSL 560K 500 |
| C20    | Ceramic 0.047 50V     | CKDYF 473Z 50  |
| C21    | Ceramic 0.047 50V     | CKDYF 473Z 50  |
| C22    | Ceramic 0.01 150V     | ACG-004        |
| C23    | Ceramic 0.01 150V     | ACG-004        |
| C24    | Electrolytic 0.22 10V | CSSA R22M 10   |
| C25    | Mylar 0.01 400V       | CQMA 103K 400  |
| C26    | Ceramic 0.01 150V     | ACG-004        |

## SEMICONDUCTORS

| Symbol                                                            | Description | Part No.                                |
|-------------------------------------------------------------------|-------------|-----------------------------------------|
| Q1                                                                | Transistor  | 2SA798-G                                |
| Q2                                                                | Transistor  | 2SC1775A-E<br>(2SC1775A-D)              |
| Q3                                                                | Transistor  | 2SC1775A-E<br>(2SC1775A-D)              |
| * hfe of these transistors (Q2, Q3) should have the same value.   |             |                                         |
| Q4                                                                | Transistor  | 2SC1439-V<br>(2SC1439-B)                |
| Q5                                                                | Transistor  | 2SA858-V<br>(2SA858-B)                  |
| Q6                                                                | Transistor  | 2SA733-Q<br>(2SA733-R)                  |
| Q7                                                                | Transistor  | 2SC945A-Q<br>(2SC945A-P)                |
| Q8                                                                | Transistor  | 2SC1904A-V<br>(2SC1904A-B)              |
| Q9                                                                | Transistor  | 2SA899A-V<br>(2SA899A-B)                |
| * hfe of these transistors (Q8, Q9) should have the same value.   |             |                                         |
| Q10                                                               | Transistor  | 2SD608A-R<br>(2SD608A-S)<br>(2SD608A-Q) |
| Q11                                                               | Transistor  | 2SB628A-R<br>(2SB628A-S)<br>(2SB628A-Q) |
| * hfe of these transistors (Q10, Q11) should have the same value. |             |                                         |
| Q12                                                               | Transistor  | 2SC869-C<br>(2SC869-D)                  |
| Q13                                                               | Transistor  | 2SC945A-Q<br>(2SC945A-P)                |
| Q14                                                               | Transistor  | 2SA733-Q<br>(2SA733-R)                  |
| D1                                                                | Diode       | 1S2473                                  |
| D2                                                                | Varistor    | SV-04                                   |
| D3                                                                | Varistor    | SV-04                                   |
| D4                                                                | Varistor    | STV3H-G                                 |
| D5                                                                | Varistor    | STV3H-G                                 |
| D6                                                                | Diode       | 1S2473                                  |
| D7                                                                | Diode       | 1S2473                                  |
| D8                                                                | Diode       | 1S2471                                  |
| D9                                                                | Diode       | 1S2471                                  |
| D10                                                               | Diode       | 10E2 (1S1886)                           |
| D11                                                               | Diode       | 10E2 (1S1886)                           |
| D12                                                               | Diode       | 10E2 (1S1886)                           |
| D13                                                               | Diode       | 10E2 (1S1886)                           |
| D14                                                               | Diode       | 10E2 (1S1886)                           |
| D15                                                               | Diode       | 10E2 (1S1886)                           |
| D16                                                               | Diode       | 1S2472                                  |
| D18                                                               | Diode       | 1S2471                                  |
| D19                                                               | Diode       | 1S2471                                  |
| D20                                                               | Diode       | 1S2471                                  |
| D21                                                               | Diode       | 1S2471                                  |

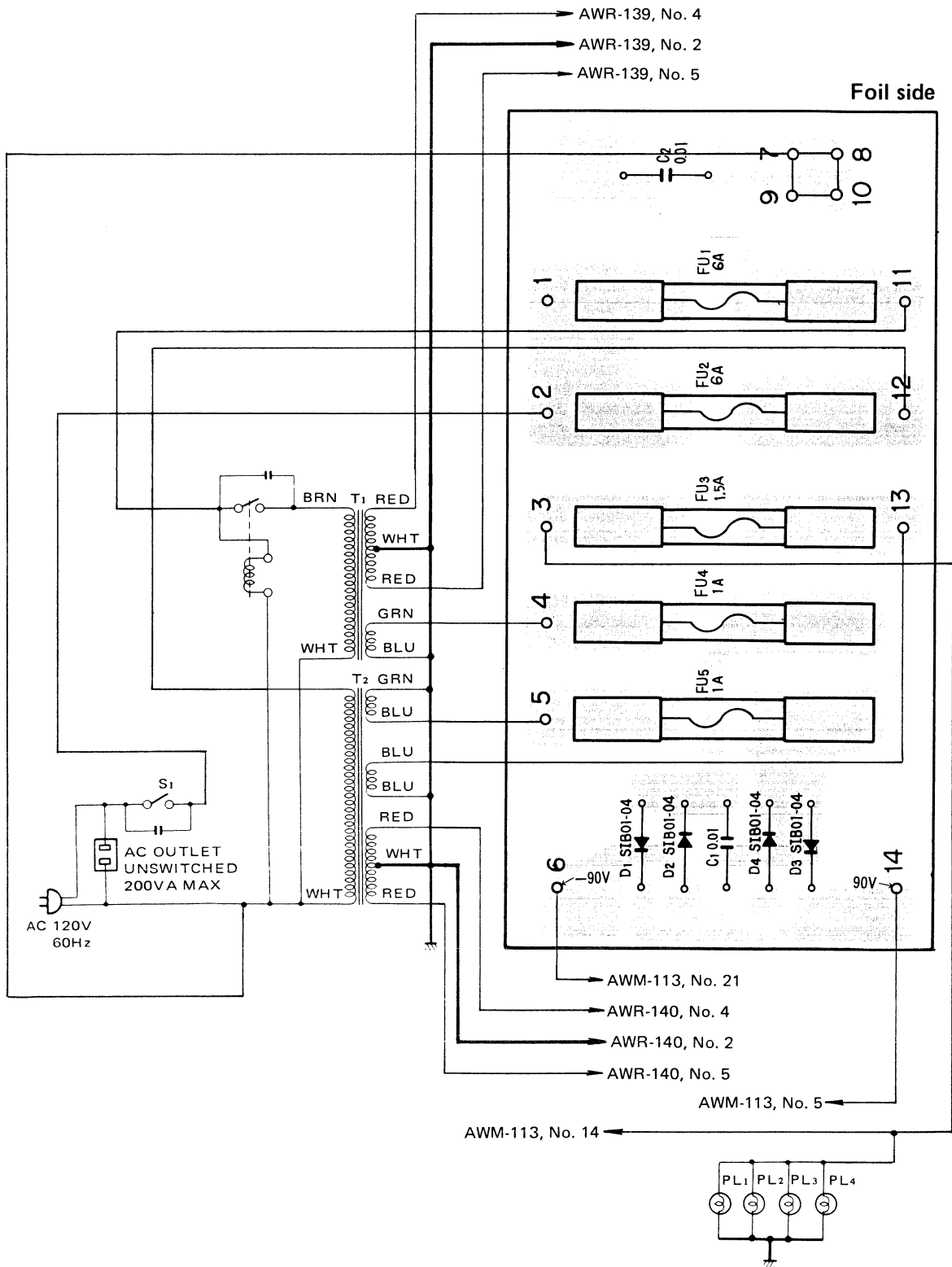
## OTHERS

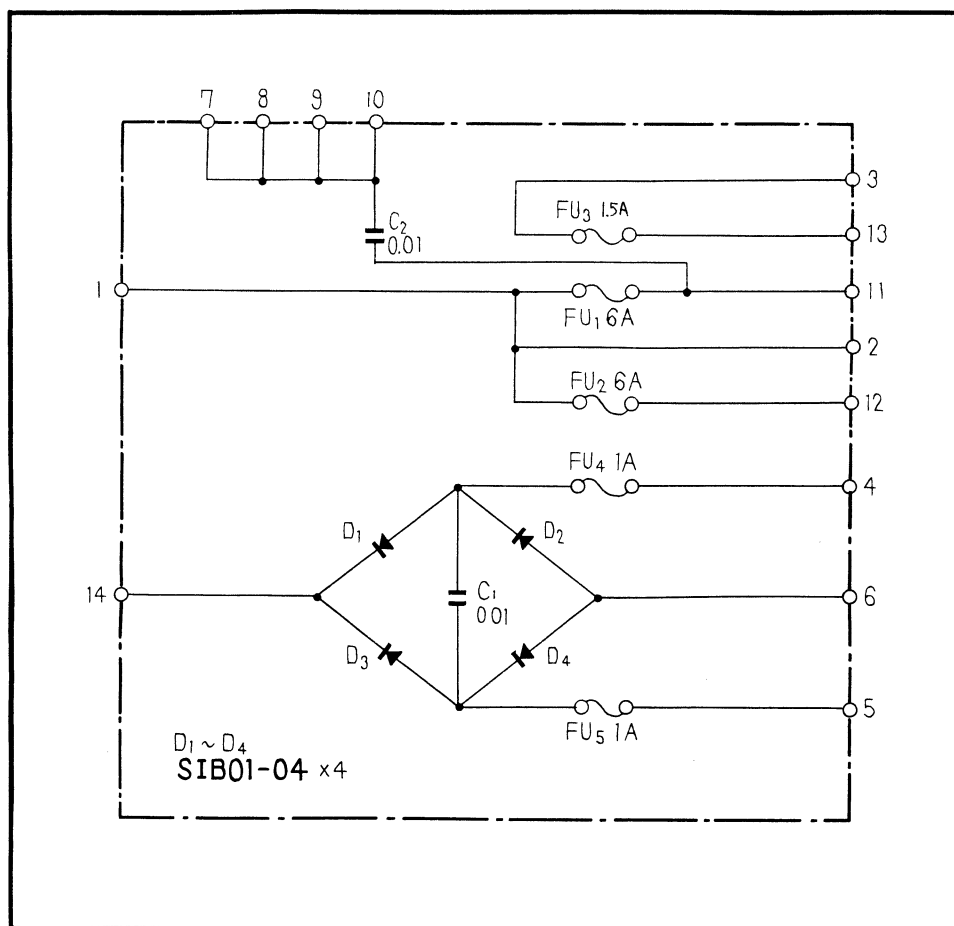
| Symbol | Description         | Part No. |
|--------|---------------------|----------|
| L1     | AF choke coil 1.1μH | ATH-012  |
| S1     | Relay               | ASR-035  |
|        | Heat sink           | ANH-340  |
|        | 5P plug             | AKM-019  |
|        | 6P plug             | AKM-020  |
|        | Screw 3 x 10        | ABA-144  |

### List of Changed Parts for Factory Modification

| Symbol | Description | Part No. |
|--------|-------------|----------|
|        |             |          |

# 10.4 FUSE ASSEMBLY (AWR-143)





### Parts List of Fuse Assembly (AWR-143)

#### CAPACITORS

| Symbol | Description       | Part No.      |
|--------|-------------------|---------------|
| C1     | Mylar 0.01 400V   | CQMA 103K 400 |
| C2     | Ceramic 0.01 125V | ACG-003       |

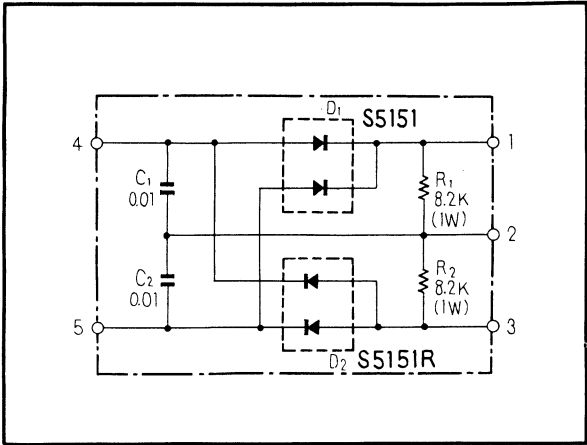
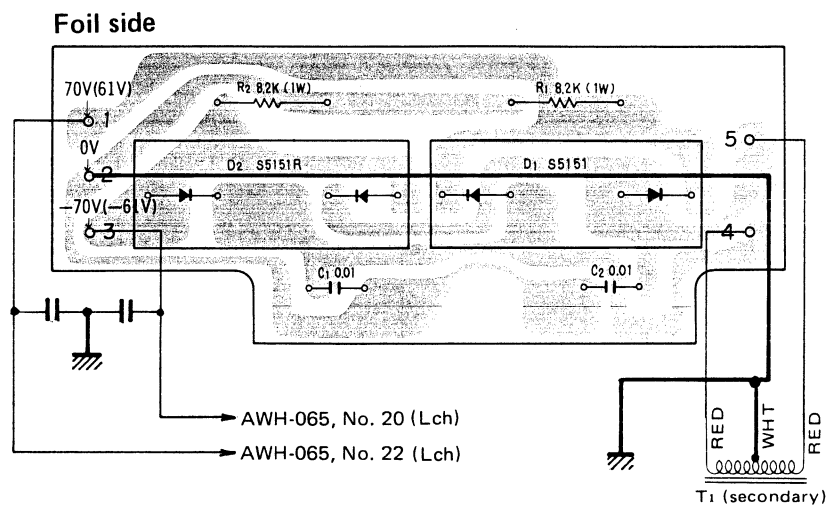
#### SEMICONDUCTORS

| Symbol | Description | Part No. |
|--------|-------------|----------|
| D1     | Diode       | SIB01-04 |
| D2     | Diode       | SIB01-04 |
| D3     | Diode       | SIB01-04 |
| D4     | Diode       | SIB01-04 |

#### OTHERS

| Symbol | Description | Part No. |
|--------|-------------|----------|
|        | Fuse clip   | AKR-013  |
|        | Fuse clip   | AKR-030  |

10.5 POWER SUPPLY ASSEMBLY (AWR-139)



Parts List of Power Supply Assembly (AWR-139)

RESISTORS

| Symbol | Description        | Part No.  |
|--------|--------------------|-----------|
| R1     | Metal film 8.2k 1W | RS1P 822J |
| R2     | Metal film 8.2k 1W | RS1P 822J |

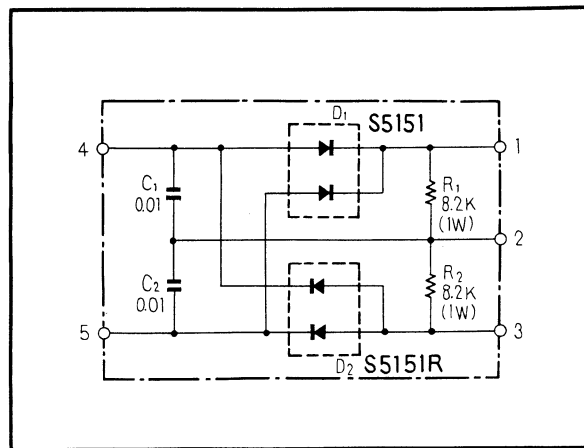
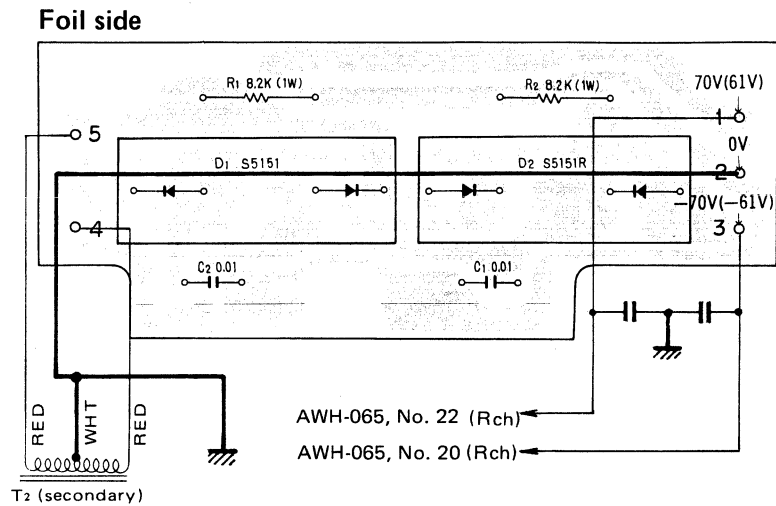
SEMICONDUCTORS

| Symbol | Description | Part No.      |
|--------|-------------|---------------|
| D1     | Diode       | S5151 (SS5)   |
| D2     | Diode       | S5151R (SS5R) |

CAPACITORS

| Symbol | Description     | Part No.      |
|--------|-----------------|---------------|
| C1     | Mylar 0.01 400V | CQMA 103K 400 |
| C2     | Mylar 0.01 400V | CQMA 103K 400 |

## 10.6 POWER SUPPLY ASSEMBLY (AWR-140)



## Parts List of Power Supply Assembly (AWR-140)

## RESISTORS

| Symbol | Description        | Part No.  |
|--------|--------------------|-----------|
| R1     | Metal film 8.2k 1W | RS1P 822J |
| R2     | Metal film 8.2k 1W | RS1P 822J |

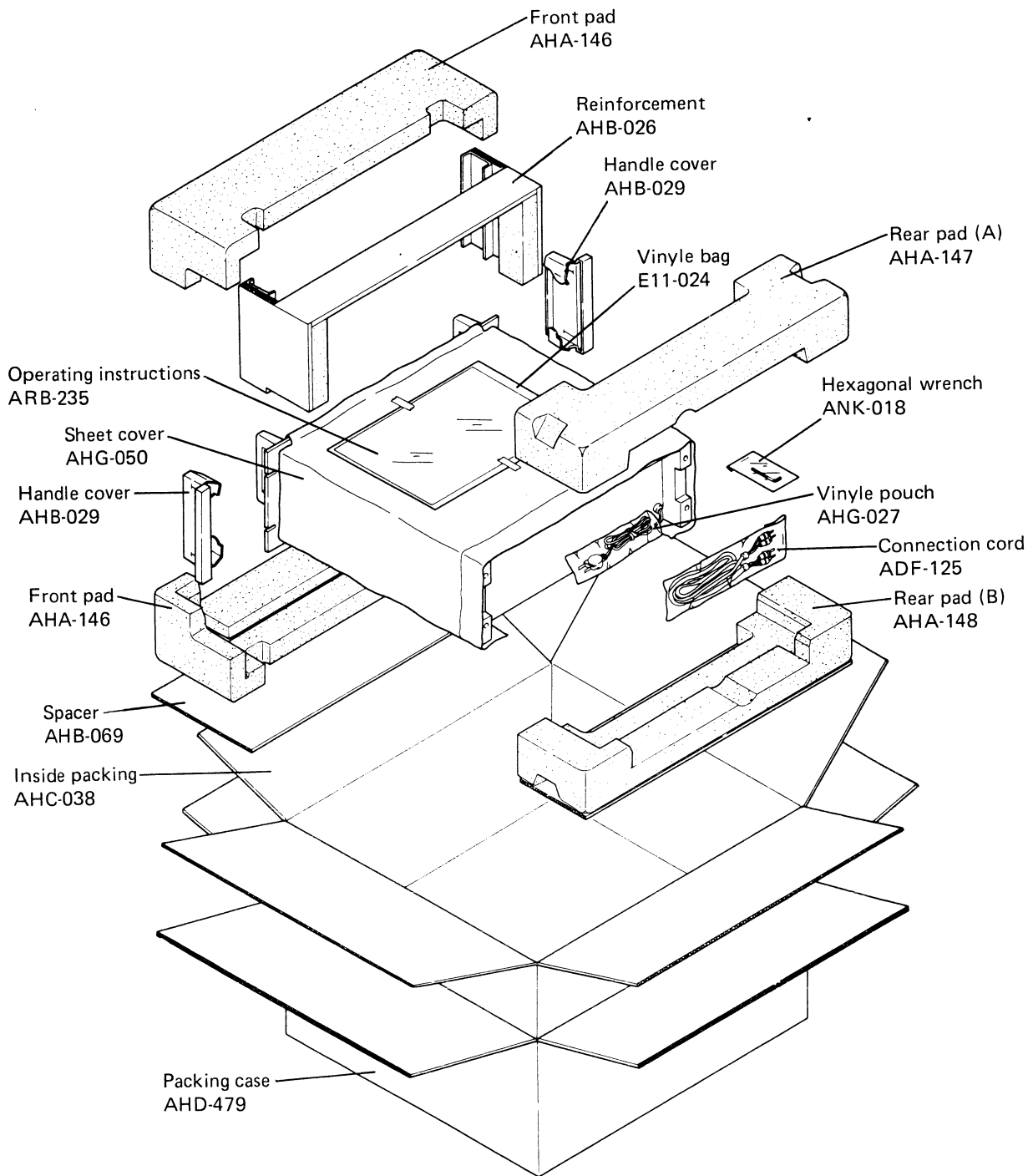
## SEMICONDUCTORS

| Symbol | Description | Part No.      |
|--------|-------------|---------------|
| D1     | Diode       | S5151 (SS5)   |
| D2     | Diode       | S5151R (SS5R) |

## CAPACITORS

| Symbol | Description     | Part No.      |
|--------|-----------------|---------------|
| C1     | Mylar 0.01 400V | CQMA 103K 400 |
| C2     | Mylar 0.01 400V | CQMA 103K 400 |

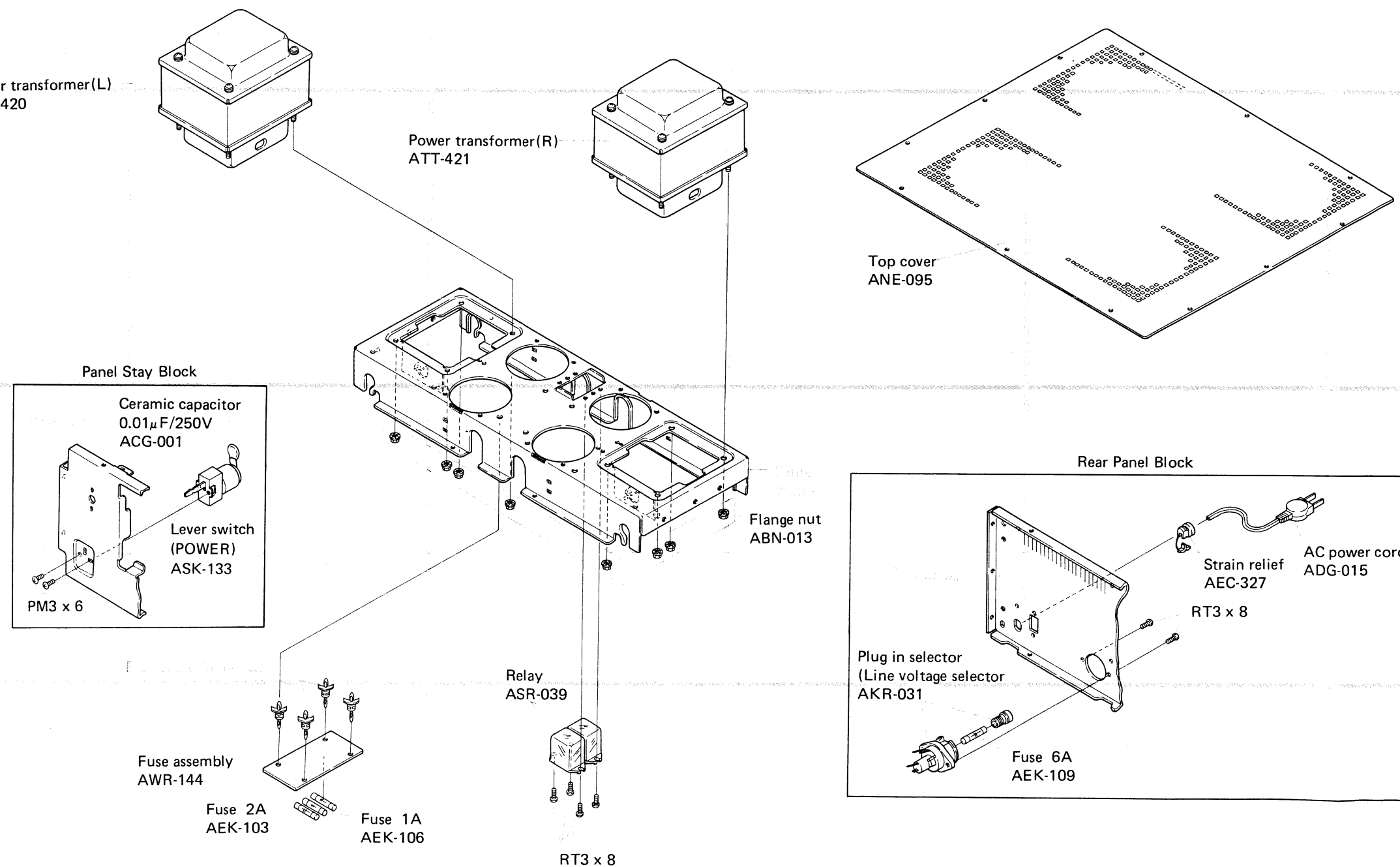
## 11. PACKING



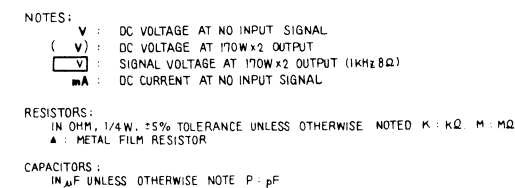
## 2. EXPLODED VIEW

## NOTE:

Parts indicated in green type cannot be supplied.



### Schematic Diagram



STEREO POWER AMPLIFIER

# SPEC-4

S

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Additional

## *Service Manual*

NOTES

- This leaflet provides the description of the parts applies only to the "S" type. For detailed please refer to the service manual of "KU" type (p. 1 ~ p. 40).
- The specifications for "S" type is same as "KU" type except for following section.

Power Requirements . . . 110V, 120V, 220V and 240V (Switchable), 50/60Hz

Power Consumptions . . . . . 760W Max.

# 1. CONTRAST OF MISCELLANEOUS PARTS

## P.C. BOARD ASSEMBLY

| Symbol | Description   | Part No. |         | Remarks |
|--------|---------------|----------|---------|---------|
|        |               | KU type  | S type  |         |
|        | Fuse assembly | AWR-143  | AWR-144 |         |

## TRANSFORMERS

| Symbol | Description       | Part No. |         | Remarks |
|--------|-------------------|----------|---------|---------|
|        |                   | KU type  | S type  |         |
| T1     | Power transformer | ATT-416  | ATT-420 |         |
| T2     | Power transformer | ATT-417  | ATT-421 |         |

## SWITCHES

| Symbol | Description                                 | Part No.  |           | Remarks |
|--------|---------------------------------------------|-----------|-----------|---------|
|        |                                             | KU type   | S type    |         |
| S1     | Lever switch (POWER)                        | ASK-080   | ASK-133   |         |
| S2     | Relay                                       | ASR-041   | ASR-039   |         |
|        |                                             | (ASR-040) | (ASR-038) |         |
| S3     | Relay                                       | .....     | ASR-039   |         |
|        |                                             |           | (ASR-038) |         |
| S4     | Plug in selector<br>(Line voltage selector) | .....     | AKR-031   |         |

## CAPACITORS

| Symbol | Description               | Part No. |         | Remarks |
|--------|---------------------------|----------|---------|---------|
|        |                           | KU type  | S type  |         |
| C8     | Ceramic 0.01 $\mu$ F 250V | .....    | ACG-001 |         |
| C9     | Ceramic 0.01 $\mu$ F 250V | ACG-001  | ACG-001 |         |
| C10    | Ceramic 0.01 $\mu$ F 250V | .....    | ACG-001 |         |
| C11    | Ceramic 0.01 $\mu$ F 250V | .....    | ACG-001 |         |
| C12    | Ceramic 0.01 $\mu$ F 250V | .....    | ACG-001 |         |

## FUSE

| Symbol | Description | Part No. |        | Remarks |
|--------|-------------|----------|--------|---------|
|        |             | KU type  | S type |         |
| FU2    | Fuse 6A     | AEK-109  | .....  |         |

## FURNISHED PARTS

| Symbol | Description            | Part No. |         | Remarks |
|--------|------------------------|----------|---------|---------|
|        |                        | KU type  | S type  |         |
|        | Operating instructions | ARB-235  | ARB-236 |         |
|        | Vinyl pouch (for fuse) | .....    | E11-033 |         |
|        | Fuse 6A                | .....    | AEK-109 |         |
|        | Fuse 12A               | .....    | AEK-113 |         |

## OTHERS

| Symbol | Description   | Part No. |         | Remarks |
|--------|---------------|----------|---------|---------|
|        |               | KU type  | S type  |         |
|        | AC power cord | ADG-013  | ADG-015 |         |
|        | Top cover     | ANE-097  | ANE-095 |         |

## Miscellaneous Parts List

## SWITCHES

| Symbol | Description                                 | Part No.             |
|--------|---------------------------------------------|----------------------|
| S1     | Lever switch (POWER)                        | ASK-133              |
| S2     | Relay                                       | ASR-039<br>(ASR-038) |
| S3     | Relay                                       | ASR-039<br>(ASR-038) |
| S4     | Plug in selector<br>(Line voltage selector) | AKR-031              |

## LAMPS AND FUSES

| Symbol | Description               | Part No. |
|--------|---------------------------|----------|
| PL1    | Lamp (bar type) 8V, 300mA | AEL-077  |
| PL2    | Lamp (bar type) 8V, 300mA | AEL-077  |
| PL3    | Lamp (bar type) 8V, 300mA | AEL-077  |
| PL4    | Lamp (bar type) 8V, 300mA | AEL-077  |
| FU1    | Fuse 6A                   | AEK-109  |
| FU3    | Fuse 2A                   | AEK-103  |
| FU4    | Fuse 1A                   | AEK-106  |
| FU5    | Fuse 1A                   | AEK-106  |

## TRANSFORMERS

| Symbol | Description           | Part No. |
|--------|-----------------------|----------|
| T1     | Power transformer (L) | ATT-420  |
| T2     | Power transformer (R) | ATT-421  |

## POTENTIOMETERS

| Symbol | Description                             | Part No. |
|--------|-----------------------------------------|----------|
| VR1    | Variable resistor 100k $\Omega$ (LEVEL) | ACV-021  |
| VR2    | Variable resistor 100k $\Omega$ (LEVEL) | ACV-021  |

## CAPACITORS

| Symbol | Description             | Part No.     |
|--------|-------------------------|--------------|
| C1     | Electrolytic 22,000 80V | ACH-056      |
| C2     | Electrolytic 22,000 80V | ACH-056      |
| C3     | Electrolytic 22,000 80V | ACH-056      |
| C4     | Electrolytic 22,000 80V | ACH-056      |
| C5     | Ceramic 0.01 250V       | ACG-001      |
| C6     | Polypropylene 33p 50V   | CQSB 330K 50 |
| C7     | Polypropylene 68p 50V   | CQSB 680K 50 |
| C8     | Ceramic 0.01 250V       | ACG-001      |
| C9     | Ceramic 0.01 250V       | ACG-001      |
| C10    | Ceramic 0.01 250V       | ACG-001      |
| C11    | Ceramic 0.01 250V       | ACG-001      |
| C12    | Ceramic 0.01 250V       | ACG-001      |

## SEMICONDUCTORS

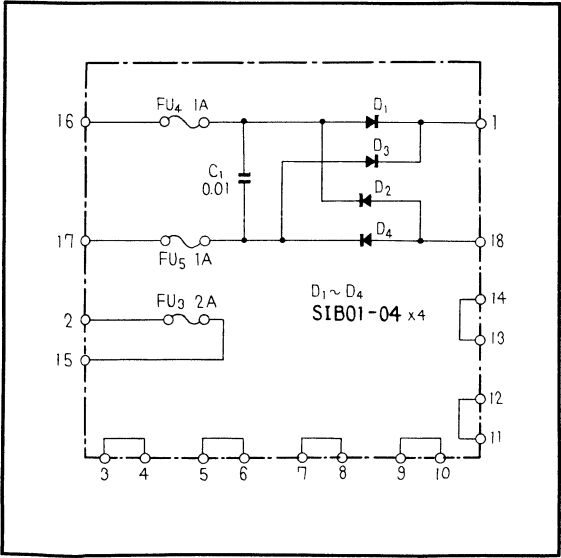
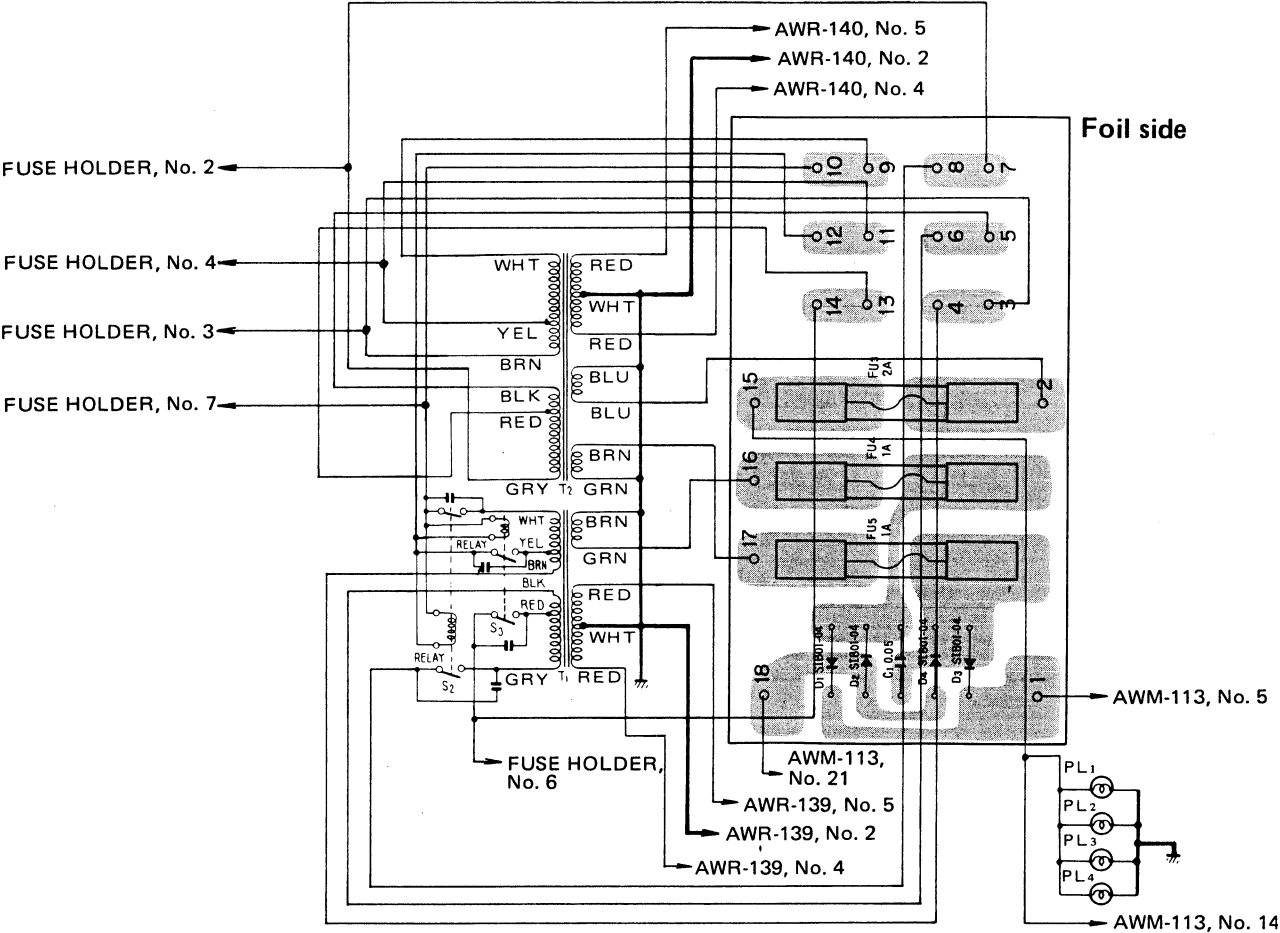
| Symbol | Description | Part No.                         |
|--------|-------------|----------------------------------|
| Q1     | Transistor  | 2SD424-R or O<br>(2SD555-R or S) |
| Q2     | Transistor  | 2SD424-R or O<br>(2SD555-R or S) |
| Q3     | Transistor  | 2SB554-R or O<br>(2SB600-R or S) |
| Q4     | Transistor  | 2SB554-R or O<br>(2SB600-R or S) |
| Q5     | Transistor  | 2SD424-R or O<br>(2SD555-R or S) |
| Q6     | Transistor  | 2SD424-R or O<br>(2SD555-R or S) |
| Q7     | Transistor  | 2SB554-R or O<br>(2SB600-R or S) |
| Q8     | Transistor  | 2SB554-R or O<br>(2SB600-R or S) |

\* hfe of these transistors (Q1 ~ Q8) should have the same value.

## OTHERS

| Symbol | Description              | Part No. |
|--------|--------------------------|----------|
|        | Power amplifier assembly | AWH-065  |
|        | Meter amplifier assembly | AWM-113  |
|        | Power supply assembly    | AWR-139  |
|        | Power supply assembly    | AWR-140  |
|        | Fuse assembly            | AWR-144  |
|        | Peak meter               | AAW-068  |
|        | AC socket (OUTLET)       | AKP-002  |
|        | Terminal (OUTPUT)        | AKE-037  |
|        | 2P terminal (INPUT)      | AKB-034  |
|        | Terminal (GND)           | AKE-019  |
|        | 5P housing               | AKX-017  |
|        | 6P housing               | AKX-018  |
|        | Contact piece            | AKF-028  |
|        | AC power cord            | ADG-015  |

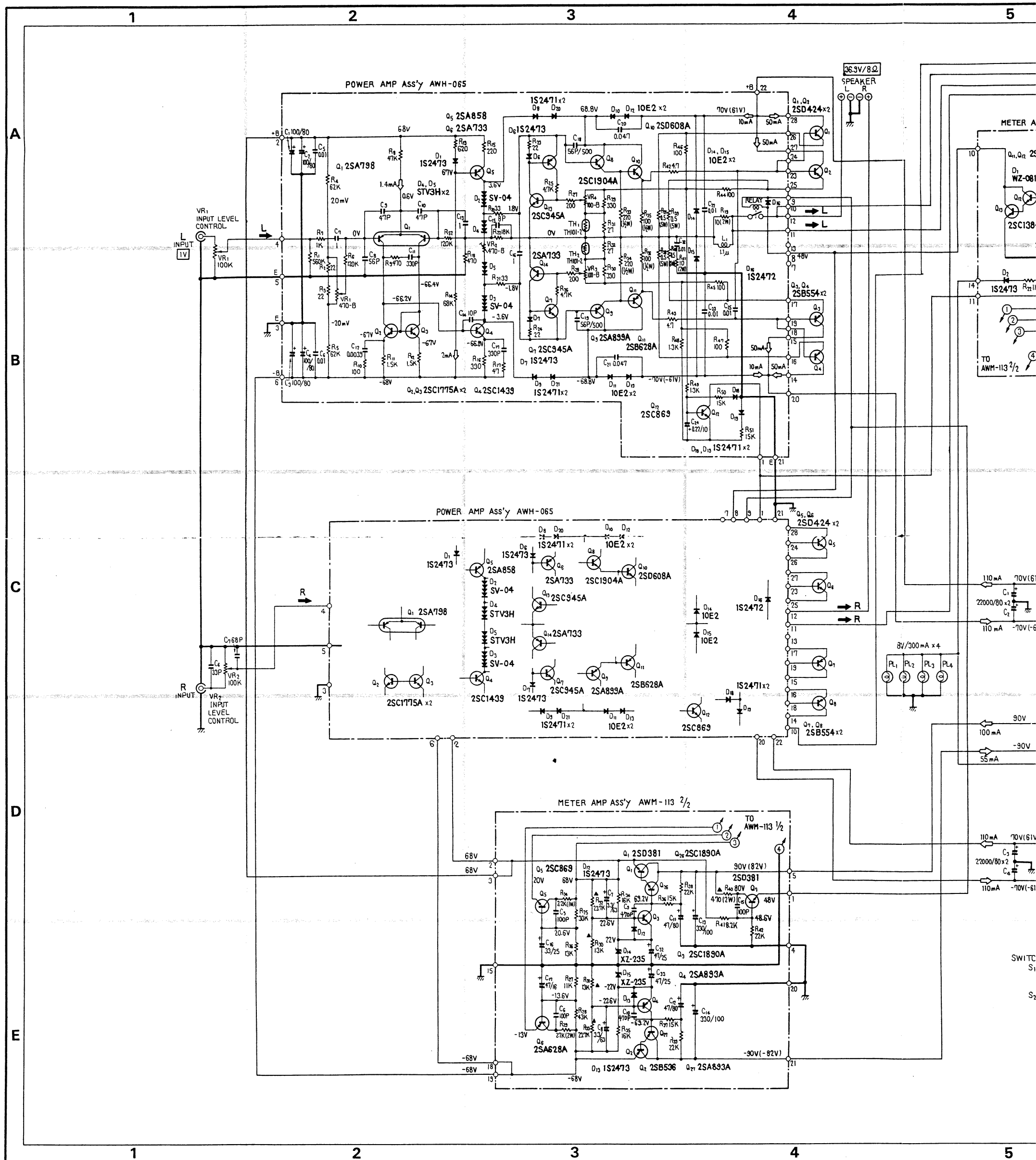
3.2 FUSE ASSEMBLY (AWR-144)

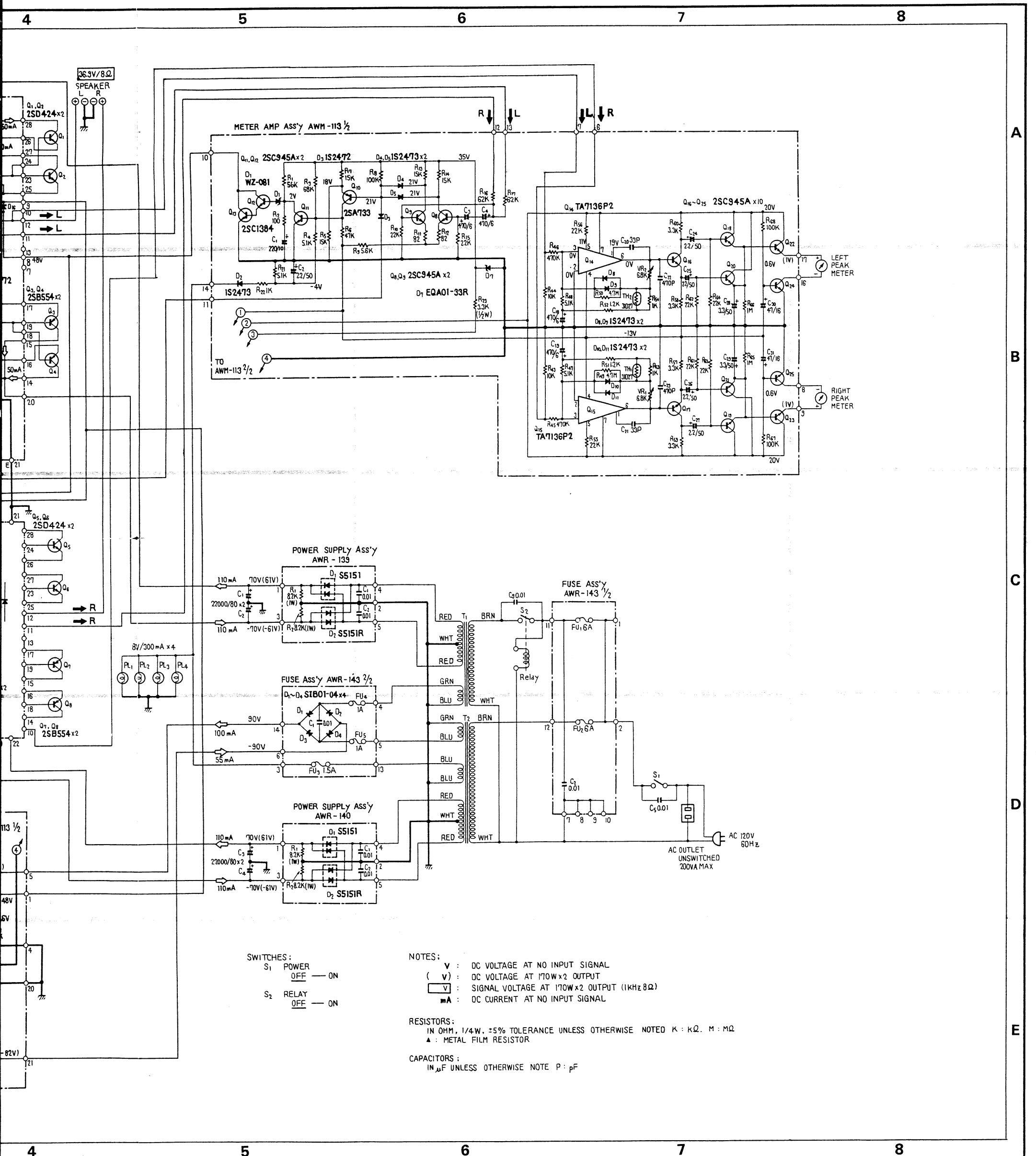


Parts List of Fuse Assembly (AWR-144)

| Symbol | Description     | Part No.      |
|--------|-----------------|---------------|
| C1     | Mylar 0.01 400V | CQMA 103K 400 |
| D1     | Diode           | SIB01-04      |
| D2     | Diode           | SIB01-04      |
| D3     | Diode           | SIB01-04      |
| D4     | Diode           | SIB01-04      |
|        | Fuse clip       | AKR-013       |

# SPEC-4 KU





# STEREO POWER AMPLIFIER

# SPEC-4

